

Graduate Studies Handbook

Department of Molecular and Cellular Biology

University of Guelph

2017/2018

Please see the archive for prior editions of this handbook.
Revisions (since September 2016) are **highlighted in red**.

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1.1 ADMINISTRATION OF THE GRADUATE PROGRAMS

The Molecular and Cellular Biology (MCB) Graduate Studies Committee administers the admission of students to the Graduate Programs and the completion of those programs in cooperation with the office of the College of Biological Science (CBS) Associate Dean of Research. The Committee is assisted by the CBS Admissions Assistant and the MCB Graduate Program Assistant. Students enrolled in these programs are guided by Advisors who are members of the University's Graduate Faculty. Each student's program is monitored by an Advisory Committee comprised of one or more faculty Advisors and one or more additional faculty members.

1.1.1 The Graduate Studies Committee

The Graduate Studies Committee is convened by the Chair and faculty of the Department of Molecular and Cellular Biology and Chaired by the Graduate Program Coordinator. The Committee works with the Office of the Associate Dean of Research to manage the recruitment and admission of students to the MSc and PhD programs. The Graduate Studies Committee acts as the agent of the faculty to administer the MCB Graduate Program and maintain academic standards. Key decisions are made collectively by the faculty of the Department.

Normally the Graduate Studies Committee includes two graduate students, the Graduate Program Assistant, and six faculty members appointed biennially, with the possibility of an additional term, by the Department Chair. A faculty member of the Committee is assigned to act as Graduate Program Coordinator.

The current Graduate Studies Committee comprises:

Dr. Mark Baker
Dr. Andrew Bendall (Graduate Program Coordinator, SSC3459, abendall@uoguelph.ca, x53491)
Dr. Manfred (Fred) Brauer
Ms. Olivia Grafinger (Student Member)
Dr. Azad Kaushik
Mr. Sean Liston (Student Member)
Ms. Bertilla Moroni (Graduate Program Assistant, SSC4480, bmoroni@uoguelph.ca, x56246)
Dr. Annette Nassuth
Dr. John Vessey
Dr. Joseph Yankulov

The CBS Graduate Admissions Assistant is Ms. Karen White (SSC3479, white@uoguelph.ca, x52730).

1.1.2 Responsibilities of the Graduate Studies Committee

The Graduate Program Coordinator:

- a. chairs the Graduate Studies Committee,
- b. is designated by the Chair of the Department as the approved signing authority for matters pertaining to the Graduate Program of the Department,
- c. reports to the Assistant Vice-President (Graduate Studies) which students will graduate each semester.
- d. serves as the Departmental representative on Division 3 and Division 4 Committees of the Board of Graduate Studies, and
- e. oversees the submission of Graduate Calendar additions and deletions to the Office of the Assistant Vice-President (Graduate Studies).

Working with the Graduate Program Assistant, the Graduate Studies Committee:

- a. evaluates applications for admission to the graduate programs.
- b. maintains a file relating to the academic program of each graduate student, including transcripts, letters

of reference and correspondence relating to admission, a copy of correspondence and of all reports pertaining to the student's academic program and progress and the results of qualifying and final examinations.

- c. reviews the Evaluation Report form submitted for each student by each Advisory Committee each semester,
- d. formulates Departmental scholarship nominations,
- e. determines the composition of Qualifying and Thesis Defense Examining Committees, arranging each Examination and chairing each Examining Committee.
- f. edits the Graduate Studies Handbook, and
- g. formulates changes in policies with respect to the graduate program (e.g. student recruitment, admissions, course offerings, degree requirements and stipends) for consideration by the faculty of the Department.

1.2 REGISTRATION IN THE GRADUATE PROGRAMS

1.2.1 Registration

Course Add/Drop & Change Form

The Academic Schedule, including registration/course selection deadlines, is provided in the Graduate Calendar. In special circumstances, a student may be permitted to register up to 14 class days after the opening date with an appropriate late fee being assessed.

In the **first semester**, students must register for UNIV*7510 (Full Time Registration) **or** UNIV*7520 (Part Time Registration) **and** for UNIV*7100 - Academic Integrity for Grad Students – an online course to be completed by the 20th class day. MCB students will also register for MCB6500 or MCB7500, as well as any other regular graduate courses on the advice of their advisory committee.

In the **second semester**, students must register for UNIV*7510 (Full Time Registration) **or** UNIV*7520 (Part Time Registration) **and re-register** for the second semester of MCB6500 or MCB7500, as well as any other regular graduate courses on the advise of their advisory committee.

In **subsequent semesters**, students must register for UNIV*7510 (Full Time Registration) **or** UNIV*7520 (Part Time Registration). **Students who do not register to take any other regular courses must also register for UNIV*7500 (Research/Writing).**

New students with Regular (not Provisional) Status may register through **WebAdvisor**, or in person, up until the last date for registration for new students as announced in the Academic Schedule (see 1.2.3 regarding Provisional Status). **Continuing students** may normally register through **WebAdvisor** six to eight weeks in advance of the start date for each semester. Alternatively, a continuing student may file a *Course Add/Drop & Change Form* in the Office of Graduate Studies. The form must be signed by the Graduate Program Coordinator before it is submitted to the Office of Graduate Studies.

Students wishing to register in any undergraduate course or course for audit must obtain the instructor's signature on the *Course Add/Drop & Change Form*. Students registered in multi-semester courses must register in *each* semester in which they are actively engaged in course requirements, unless otherwise stated in the course description.

Financial statements are available on WebAdvisor following the course selection period for all preregistered students. Payment of account by the published deadline will complete the registration process. Late payment will result in the assessment of late fees. Failure to make appropriate payment arrangements by the end of the add period for the semester will result in the cancellation of enrolment (de-registration) for that semester. Reactivation of the registration may only be approved with full payment or upon approval of Student Financial Services.

University ID cards, which are used for identification as well as for building, library and bus access, are produced and validated at the ID Card Centre, University Centre level 3 upon initial registration. Validation stickers will be provided each semester to registered continuing students. Loss or theft of a university card should be reported at the ID Card Centre.

1.2.2 Program Changes

Changes of registration (course deletion or addition) may only be made on the recommendation of the student's Advisory Committee and with the approval of the Graduate Studies Committee and the Assistant Vice-President (Graduate Studies). Credit is given only for courses listed on the *Course Add/Drop & Change Form* or authorized through an official change of registration. Both semesters of 2-semester courses must be dropped. Students who wish to re-take a 2 semester course must re-take both parts of the course. The

deadline to drop a 2-semester course is the add deadline date specified for the second semester of the course.

A student who wishes to withdraw from the University is expected to consult with the Graduate Program Coordinator before submitting the withdrawal notice to the Office of Graduate Studies. A student who withdraws from the university must return all borrowed library materials immediately upon withdrawal, regardless of the original due date. Any items not returned will be declared lost and their cost will be charged to the student's account. Within the time limits described in the Academic Schedule, approval of the withdrawal entitles the student to a refund on a prorated basis. No such refund may be claimed without the authorization of the Office of Graduate Studies (the Assistant Vice-President Graduate Studies and Program Quality Assurance).

In the event that a student fails to obtain satisfactory standings or to make satisfactory progress either in course work or in research, the Board of Graduate Studies may require the student to withdraw. Registration will be cancelled as of a date specified by the Board and an appropriate refund of fees authorized.

1.2.3 Provisional Status

The minimum requirement for admission to graduate studies in MCB is a baccalaureate in an honours science program, or the equivalent, from a recognized university or college. The applicant should have achieved at least an average B⁺ standing (a 75% average grade or the equivalent) in the work of the last 2 undergraduate years.

An applicant whose qualifications do not meet the minimum program standard may be admitted as a *provisional* student. Students with provisional status must register by using the *Course Add/Drop & Change Form*. Requirements that must be met for transfer from *provisional* to *regular* status are specified in writing by the Graduate Studies Committee after consultation with the prospective Advisor. Before the end of the second semester of registration, the *provisional* student's Advisory Committee must recommend in writing to the Graduate Studies Committee either that the stated requirements have been met and the student should transfer to *regular* status or that the requirements have not been met and the student should withdraw from the graduate program. The Graduate Studies Committee then recommends the appropriate change in student status to the Assistant Vice-President (Graduate Studies).

1.2.4 MSc to PhD Program Transfer

Admission to doctoral programs normally requires at least an average B⁺ standing (a 75% average grade or the equivalent) in the baccalaureate degree, as well as a recognized MSc degree. Direct transfer from the MSc program to the PhD program will be considered for a student who has achieved excellent standing at the undergraduate level and demonstrated a superior performance and particular aptitude for research during the first three semesters in the MSc program (see 1.5.4).

1.2.5 Continuity of Registration and Leave of Absence

Students are expected to register in each consecutive semester of study until graduation. They must be registered in each semester in which they are actively engaged in course work or research, including any semester in which they have any contact with university faculty/staff or use of university facilities in connection with their degree program.

Without prior permission from the Assistant Vice-President (Graduate Studies), students normally cannot register at the University of Guelph while they are registered as a student at another university. With prior permission from the Assistant Vice-President (Graduate Studies), University of Guelph graduate students may arrange a leave of absence to register at another university. Students should consult the Office of Graduate Studies about the options available when planning such activities. In the case of conjoint or co-operative

graduate programs with other universities, arrangements will be made to ensure that the students involved are not placed at a disadvantage with respect to continuity of registration.

A regular student may make prior arrangements, subject to review and recommendation by the department, to take a Leave of Absence from graduate studies for a specified period of time, not to exceed one year. The Assistant Vice-President (Graduate Studies) may routinely approve a Leave of Absence for students who request permission not to register for one semester, without adjustment to time allotted. The Board of Graduate Studies may approve a Leave of Absence for students who request permission not to register for two or more consecutive semesters. Further leave(s) of absence may be granted subject to review and recommendation by the Department and approval by the Board of Graduate Studies. A leave of absence approved by the Board of Graduate Studies will include adjustments in the time allotted for completion of the graduate program.

Failure to register or receive prior permission for a leave of absence will be regarded as withdrawal from graduate studies. Students who wish to resume their studies must apply for readmission; if readmitted they will be required to conform to current regulations.

A student who has not completed all the requirements for the degree by the due date for thesis submission in a particular semester must re-register. Candidates must be registered in the semester in which they qualify for the degree.

1.2.6 Parental Leave

Parental Leave is accommodated under the Leave of Absence regulation (see 1.2.5). Some agencies (e.g. NSERC and CIHR) provide parental leave funding for Graduate Scholarship holders. Application requirements and funding information can be found on the agency web sites. Both the University and the funding agencies require application months in advance of an anticipated birth. The University requires parental leave periods to correspond with semesters.

Students are not required to fulfill academic requirements within the two week periods before and after an expected birth date (due date), nor will a thesis defense be scheduled within those periods.

1.2.7 Academic Accommodation for Students with Disabilities

The University's guidelines and procedures for academic accommodation for students with disabilities are available online. Students are encouraged to register with Student Accessibility Services and submit accommodation requests to the Department as early as possible (if possible during the application and admission processes).

Requests for accommodation of graduate students with disabilities in courses other than MCB*6500 and MCB*7500 are handled according to University Guidelines and Procedures (see section 6). All other accommodation requests are reviewed by the Graduate Studies Committee. Requests for accommodation in MCB*6500 or MCB*7500 must be submitted before or at the time of course registration. Requests for accommodation during Qualifying Examinations or Thesis Defenses must be submitted before or with the examination request. Such requests must include a written (a) recommendation from Student Accessibility Services, (b) request from the student, and (c) recommendation from the student's Advisory Committee regarding the requested accommodation(s).

1.3 THE ADVISORY COMMITTEE

According to University requirements, graduate students complete the MSc or PhD program under the guidance of an Advisory Committee. University of Guelph policies on the Responsibilities of Advisors, the Advisory Committee and Graduate Students are found here:

<http://www.uoguelph.ca/registrar/calendars/graduate/current/geninfo/geninfo-por.shtml>

Advisory Committees encourage students to make full use of the resources of the University, in both the material and intellectual senses, and particularly by encouraging wide discussion of the individual's research in the Department. Advisory Committee members are expected to fulfil each of the responsibilities outlined below unless they have been excused from them by the Department Chair, upon the recommendation of the Advisory Committee.

The Advisory Committee consults the student, his or her research Advisor and the Departmental Graduate Studies Committee regarding all aspects of the student's graduate program. These include course selection, the research program, an application for direct transfer from the MSc to the PhD program, the composition of Qualifying and Thesis Examination Committees and other issues as they arise. The Graduate Studies Committee consults the Advisory Committee on all decisions concerning each graduate student's program, including evaluation of the student's progress, applications for direct transfer from the MSc to the PhD program and eligibility for scholarship support. The Advisory Committee meets with the student at least once per year and it is desirable for students to discuss their progress with each Advisory Committee member at least once per semester. The Committee reports on the student's progress, in writing, each semester. Members of the Committee advise the student on his or her readiness to prepare a thesis, offer comments upon a complete thesis draft and indicate whether they find a revised draft to be ready for examination (Section 1.7).

Students and Advisors have the right to request a formal meeting of the Advisory Committee or to appear before the Graduate Studies Committee at any time. Requests for such meetings should be conveyed in writing to the Advisory and Graduate Studies Committees.

1.3.1 Structure and Selection of the Advisory Committee

Advisory Committees include the Advisor (or Co-Advisors) and other members of the University's Graduate Faculty, selected through consultation between the student and the Advisor. The Advisory Committees of MSc students include at least two members whereas the Advisory Committees of PhD students include at least three members including the Advisor. For PhD students, at least two Committee members should be Department members and it is desirable that at least one Committee member should not be a member of the Molecular and Cellular Biology Department. Minimally at least one Committee member should represent a different discipline from the student, within the Department. Involvement of faculty members from other Departments and other individuals with relevant expertise as Advisory Committee members is encouraged.

To serve as a Co-Advisor or a member of an Advisory Committee, an individual who is not a member of the Graduate Faculty must be appointed as Associated Graduate Faculty or Special Graduate Faculty. Faculty Advisors prepare nominations for Associated or Special Graduate Faculty status in collaboration with the Graduate Program Assistant. Such nominations are submitted to the Board of Graduate Studies by the Department.

The completed Advisory Committee Appointment Form must be submitted to the Graduate Program Assistant, endorsed by the Graduate Program Coordinator, and approved by the Assistant Vice-President (Graduate Studies) *by the middle of the student's second semester of registration*. Once the Committee is struck, it cannot be changed without the approval of the Coordinator and the Assistant Vice-President (Graduate Studies). Addition of extra Committee members to replace faculty members who have left the University, or who are unavailable during sabbatical leaves, is encouraged.

To facilitate the grading of research proposals, students should submit their Advisory Committee Appointment Form and Program Degree Form by the 10th week of their first semester.

1.3.2 Responsibilities of the Advisory Committee

1.3.2.1 Program of Study

The Advisory Committee establishes the prescribed program of study for the student as required by University regulation for MSc and for PhD students. The prescribed studies are based on Departmental program requirements (see Sections 1.5 and 1.6) as well as the student's academic background, research experience and any deficiencies in knowledge identified by the Advisory Committee. The degree program must be established *by the end of student's second semester of registration* through submission of the Degree Program form, endorsed by the Graduate Program Coordinator, to the Office of Graduate Studies.

The research project should be planned carefully so that the student and the Advisory Committee members agree that it is appropriate for the degree being sought. The planned research should allow the MSc program to be completed in 6 semesters, the PhD program (post MSc) to be completed in 9 semesters, and the PhD program (direct entry or transfer from the MSc) to be completed in 12 semesters (including the period spent as an MSc student).

1.3.2.2 Graduate Courses

Advisory Committee members advise the student on preparation of the Literature Review and Research Proposal (course MCB*6500/MCB*7500), and attend presentations made by the student in these courses and at the Graduate Student Symposium. Students must therefore consult their Advisory Committee members on the scheduling of these events. Advisory Committee members participate in grading the course requirements (Sections 1.5 and 1.6). Advisory Committee meetings held after the student's presentations are devoted to discussion and evaluation of the student's research progress and plans.

1.3.2.3 Progress Reviews

Advisory Committees meet no less than once a year. The student submits a written progress report to the Committee members at least a week in advance of each meeting. At the meeting, the student presents a detailed progress report of work completed since the last meeting, relating that progress to the previous research plan. Satisfactory progress is commended. Areas of concern are discussed with the student. A research plan and time-line for the following period are developed.

The student and Advisor ensure that a complete Graduate Student Evaluation Report, signed by all members of the Advisory committee and the student, is submitted to the Graduate Program Assistant at the end of each semester. Evaluation Reports are collected by the Graduate Program Assistant, copies made for departmental files and the originals sent to The Office of Graduate Studies.

Advisory Committees are encouraged to identify any problems early in the student's program and establish mechanisms to address them. Evaluation Reports indicating some concerns or unsatisfactory progress may only be submitted following a meeting of the student with the Advisory Committee. The student and Committee append a written plan to the Report delineating measures that will be taken during the next semester to address the identified concerns. A student may submit a separate one page summary of progress if he/she disagrees with the Committee's Report. A copy of the Student Evaluation Report is forwarded to The Office of Graduate Studies. Advisory Committee meetings then occur at least once per semester until the student's progress is satisfactory.

Most students complete their course work by the end of semester 2. The Advisory Committee discusses the research plan with the student no later than the beginning of semester 3. The student identifies progress made towards the research goals at subsequent meetings of the Advisory Committee or in individual

meetings with Committee members. MSc students generally present a plan for completion of the research and a thesis outline to the Advisory Committee no later than semester 5. PhD students generally present a plan for completion of the research and a thesis outline to the Advisory Committee no later than semester 7 (PhD post-MSc) or 10 (direct transfer from MSc to PhD). A schedule for further research, thesis preparation and submission is then formulated.

1.3.2.4 Thesis Preparation

At a Committee meeting, the Advisory Committee indicates when it is appropriate for the student to begin thesis preparation, establishing an appropriate schedule for completion and Committee review of the thesis. Members of the Advisory Committee review a complete thesis draft and may serve on the Examination Committee (Section 1.7).

1.3.2.5 Departmental Review

The Graduate Studies Committee reviews the progress of each student at the end of each semester. Any necessary recommendations concerning a program are made in consultation with the Advisory Committee.

Students may continue with provisional status (see 1.2.3) for only two semesters before being granted regular status or withdrawing from the Graduate Program. If the Graduate Studies Committee determines that a student has met the requirements for transfer to regular status, this program change is recommended to the Assistant Vice-President (Graduate Studies).

If the Graduate Studies Committee or the Advisory Committee finds that a student's progress is unsatisfactory, the two Committees jointly review the student's program. For example, such a review occurs if the requirements for transfer from provisional to regular status are not met during the first two semesters or if the Advisory Committee reports unsatisfactory performance in two consecutive semesters.

According to University regulations, the following process applies when it is necessary for action to be taken with respect to unsatisfactory performance by a graduate student. The Advisory Committee makes a recommendation to the Graduate Studies Committee which forwards a recommendation to the Office of Graduate Studies. The Assistant Vice-President (Graduate Studies) ensures that the student is aware of the department's recommendation and is offered the opportunity to make a submission. The recommendation of the Department and any submission from the student are considered by the Admissions and Progress Committee of the Board of Graduate Studies. The Admissions and Progress Committee makes a decision on behalf of the Board of Graduate Studies.

1.4 RESPONSIBILITIES OF THE GRADUATE STUDENT

Graduate students complete the requirements of their degree programs under the guidance of their Advisors and Advisory Committees. Student activities must be in accord with all relevant University of Guelph policies, including Research Policies: <http://www.uoguelph.ca/research/> and Health and Safety Policies: <https://www.uoguelph.ca/hr/hr-services/welcome-environmental-health-safety>

1.4.1 Prescribed Studies

All graduate students are required to complete graduate courses, participate in the annual CBS Grad Symposium, conduct research, and submit and defend a thesis based on that research. Each of these requirements is discussed more fully below (Sections 1.5, 1.6 and 2).

1.4.2 Progress Reports

Students prepare written reports on their progress, plans for further research and thesis preparation prior to each Advisory Committee meeting. A progress report is submitted to each Committee member at least one week prior to the meeting. The student's report and the Evaluation Report form completed by the Advisory Committee constitute the basis for Advisory Committee deliberations and are retained by the Advisor with the student's file. The Evaluation Report form is submitted within two weeks after every semester to the Graduate Program Assistant for review by the Graduate Studies Committee (see 1.3.2.3). Reports that indicate unsatisfactory progress or some concerns must be accompanied by a plan that addresses these concerns. All evaluation reports, signed by the student and all advisory committee members are submitted to the Assistant Vice-President (Graduate Studies).

1.4.3 Research Publications

Publication arising from research conducted by faculty members and graduate students occurs as specified by the **PUBLICATION POLICY** of the University of Guelph.

1.4.3.1 Consultation with Advisor and Advisory Committee

Graduate students will seek the Advisor's approval prior to preparing and submitting their research results for publication. This includes manuscripts for publication in refereed or non-refereed journals as well as abstracts for any conferences or meetings. In the Molecular and Cellular Biology department, graduate student research usually comprises a component of the Advisor's research program that is funded through government or private agencies. Therefore, the Advisor contributes intellectually to the conception and analysis of the research. Consequently, any publications arising from this research are considered shared publications with at least the student and Advisor being co-authors. The Advisory committee should be consulted if students wish to undertake research distinct from their thesis research that will involve the use of departmental facilities. Authorship in publications resulting from such research should also be discussed between Advisor and student and a consensus documented clearly in writing prior to commencement of the project.

1.4.3.2 Confidential Information

"When a sponsor provides information essential to the research which, at the time it is provided, is labelled "Confidential Information", the University will observe such confidentiality, provided the results of the research may be published in a form that does not disclose the confidential information."
(PUBLICATION POLICY, 1989)

1.4.3.3 Deferment of Publication

“Sponsors of research grants or contracts may request deferment of publication of the results obtained beyond the date of submission of the final report of the researcher. Deferment of publication may arise from a request by an official agency to await the publication of a government report. Industrial sponsors may request that publication be temporarily deferred to protect commercial or industrial rights arising out of the research.

Deferment of publication may be granted if:

- i) the deferment period is compatible with the estimated date of successful defence of the thesis when the research constitutes part of the academic studies of the graduate student;
- ii) deferment does not exceed a period of more than twelve months from the date of submission of the final report to the sponsor.

In special circumstances, the Vice-President Research may grant a request to defer publication for a period longer than twelve months from the date of submission of the final report to the sponsor but in no circumstances shall such deferment exceed twenty-four months.” (PUBLICATION POLICY, 1989)

1.4.3.4 Advisory Committee Meetings, Evaluation Reports and Thesis Defenses

Agreements with research sponsors must not preclude presentation of information or data during Advisory Committee meetings or inclusion of information or data in theses that is essential for evaluation of the student's research by Advisory or Examination Committee members. Further, such agreements must not restrict attendance at the MSc or PhD Oral Examination, which is public as a matter of University policy.

1.4.4 Research Data and Materials

On a regular basis, the student will deposit with the Advisor all original research data, laboratory notebooks, samples, specimens and other original material derived from the research. Copies of written material may be made by the student. However students are not allowed to remove or distribute any biological material (strains of microorganisms, DNA, proteins, antibodies etc.) without written permission from the Advisor or designate. Transfer of biological material is conducted as stipulated by the University's **ACADEMIC BIOLOGICAL MATERIAL TRANSFER AGREEMENT**.

1.4.5 Inventions Policy

In the course of completing their degree requirements, undergraduate or graduate students may discover, or help discover, technology which might be patentable and/or have the possibility for commercial development. Any students who suspect this might be the case should, without delay, contact their Research Advisor, if appropriate, and the Office of Research. Although the rights to such inventions are owned by the University, a student who is an inventor or co-inventor would share in any revenues earned by the invention according to the University's Inventions Policy.

1.4.6 Safety

On first registration, students will receive notice of their enrolment in Departmentally-mandated Safety Training modules. These modules must be completed within the specified period. Students will also receive notice of their enrolment in centrifuge training, which involves both an online and a hands-on training session. Advisors will also inform students of additional safety training requirements (e.g. Radiation Safety Training) and provide laboratory-specific safety training.

Students must be familiar with the Standard Operating Procedures for their research laboratory before beginning work in their laboratory. Additional safety information and links to MSDS sheets for organisms can be found through the University of Guelph Department of Environmental Health and Safety or through the MCB safety link at: <https://www.uoguelph.ca/mcb/mcb-health-and-safety>

1.5 THE MSc PROGRAM

The duration of the MSc program is normally six semesters.

1.5.1 Courses and Presentations

MSc students normally complete the course MCB*6500 MSc Research Topics in Molecular & Cellular Biology (1.0 credit) within their first two semesters in the program. They also complete one additional graduate course (minimum 0.5 credit). Additional courses may be recommended at the discretion of the Advisory Committee. Course outlines are provided in Section 2. Students must achieve an average of 70% (B-) or greater for all courses taken in the program.

The annual CBS Grad Symposium is normally scheduled at the end of April. All MCB graduate students who did not present a seminar in MCB*6500 or MCB*7500 during the previous year and whose thesis defense has not been scheduled as of the Symposium registration deadline are required to register and present a poster or give an oral presentation during the Grad Symposium. Thus, students in their 2nd year and beyond participate in the Symposium each year. Those who do not complete this requirement cannot graduate.

1.5.2 The MSc Research Project

Students conduct their research projects under the guidance of an Advisory Committee. This research gives the student training and experience in:

- (a) conducting a comprehensive literature search on a specific research topic;
- (b) research techniques;
- (c) the design of experiments under relatively close supervision;
- (d) the interpretation of data, and
- (e) scientific writing as embodied in scientific publications.

The thesis research should include experiments not previously reported in the literature and lead to a coherent study. Publication is not a requirement for completion of an MSc program but thesis research should yield publishable data. Students report on their thesis research progress and it is evaluated as specified in Section 1.4.

1.5.3 The MSc Examination

A final oral examination, the MSc defense, is held after completion of the research and submission of the MSc Thesis (Section 1.7).

1.5.3.1 The Examination Committee

The MSc Examination Committee is appointed by the Department Chair on the advice of the student's Advisory Committee and the Graduate Studies Committee. The Examination Committee includes:

- the Chair (normally a member of the Graduate Studies Committee who is not a member of the student's Advisory Committee),
- two members of the student's Advisory Committee, one of whom may be an Advisor, and
- one other member of the graduate faculty who is not a member of the Advisory Committee.

1.5.3.2 The Examination

The MSc Examination is open to the public. The examination begins with an oral presentation by the student which normally should last no more than 30 minutes. The student provides a brief introduction to the field of research and summarises the salient features of the research reported within the thesis. An opportunity is then provided for members of the University community to ask questions relevant to the presentation. This is followed by the examination of the thesis by the Examination Committee. No further questions from the

audience are entertained during this examination.

The examination normally involves two (or more) rounds of questions from the Committee members. The Committee then meets in the student's absence to discuss and vote on the thesis and defense. The thesis and defense are deemed satisfactory if the student receives no more than one negative vote (an abstention is considered as a negative vote). The Examination Committee communicates the result of the examination to the Department Chair, indicating whether any revisions to the thesis are required. The thesis is submitted to the Assistant Vice-President (Graduate Studies) when the revisions have been approved by the Examination Committee and the Department Chair.

1.5.4 Direct Transfer from MSc to PhD Candidacy

An MSc student may apply to transfer to the PhD program before completing the MSc degree. To be eligible for transfer, the student must have completed a high quality undergraduate degree with a grade average of B+ or higher. Applications for transfer must be approved by the end of the fourth semester in the MSc program.

Before applying for transfer to the PhD program students must complete course MCB*6500 (MSc Research Topics in Molecular and Cellular Biology) plus an additional course with at least 0.5 graduate course credit, attaining an overall A minus average (at least 80%). In completing course MCB*6500, the student will have given a departmental seminar including a review of the proposed area of research and a research proposal. In order to assess and document the student's research aptitude, the Advisory Committee and the student should discuss the student's academic plans when designing the program. During the development of the program, opportunity should be available for the student to display independence of thought, initiative, and creativity in pursuit of answers to scientific problems.

To request transfer from the MSc to the PhD program, students apply to the Graduate Studies Committee during the third or fourth semester in the MSc program. The application must include:

1. the completed and signed application form,
2. a letter from the student requesting program transfer,
3. the student's research progress report and PhD research proposal,
4. a letter from the student's Advisory Committee.

The student's progress report and proposal should clearly delineate what progress has been made during the first year in the MSc program and what specific aims will be pursued in developing that work for PhD program. Students should not seek transfer to the PhD program solely because extra time is needed to complete an MSc research project. The progress report and proposal should be written in a form that can easily be understood by any faculty member in MCB and should be no more than five pages in length.

The Advisory Committee's letter should indicate whether the student has met the grade requirements specified above and demonstrated the potential to complete the PhD program. It should include the Committee's assessment of the student's research progress while in the MSc program and the potential for the student's thesis research to expand in scope to meet the requirements of the PhD program.

In reviewing applications for direct transfer from the MSc to the PhD program, the Graduate Studies Committee will ensure that:

- the transfer criteria have been appropriately applied,
- the academic standards of the Graduate Program are maintained; and
- an equitable and fair approach to consideration for transfer is available for all graduate students.

The Graduate Studies Committee will recommend either (i) that the Department endorse the proposal for transfer, (ii) that the student reapply in the subsequent (fourth) semester, or (iii) that the request for transfer be denied, and the student be required to complete the MSc degree before applying for admission to a PhD program. The Graduate Program Coordinator submits the complete application for program transfer to the Board of Graduate Studies for final consideration.

Once the program transfer has been approved by Graduate Studies, the student must complete another set of Advisory Committee Appointment and Graduate Program Degree forms (revision only), to the Graduate Program Assistant.

1.6 THE PHD PROGRAM

The duration of a PhD program is normally nine semesters for a student who has completed an MSc degree and twelve semesters for a student without an MSc degree.

1.6.1 Courses and Presentations

PhD students normally complete course MCB*7500 PhD Research Topics in Molecular & Cellular Biology (1.0 credit) within their first two semesters in the program. Students without an MSc degree in Molecular and Cellular Biology or the equivalent are required to take one additional graduate course. Additional courses may be recommended at the discretion of the Advisory Committee. Course outlines are provided in Section 2. Students must achieve an average of 70% (B-) or greater for all courses taken in the program.

The annual CBS Grad Symposium is normally scheduled at the end of April. All MCB graduate students who did not present a seminar in MCB*6500 or MCB*7500 during the previous year and whose thesis defense has not been scheduled as of the Symposium registration deadline are required to register and present a poster or give an oral presentation during the Grad Symposium. Thus students in their 2nd year and beyond participate in the Symposium each year. Those who do not complete this requirement cannot graduate.

To be a candidate for the PhD degree, each student must pass a Qualifying Examination (Section 1.6.3).

1.6.2 The PhD Research Project

The Ph.D. research project is intended to give the student further, more intensive, experience in the areas indicated above for MSc theses. In addition, the student must develop the ability to generate innovative research ideas and implement them through carefully designed experiments. The student is expected to develop and demonstrate a high degree of scholarship and expertise in the chosen specialty and to exert critical judgement. The research must yield results which, in the opinion of the Examination Committee, warrant publication in reputable scientific journals appropriate to the area of specialization. Procedures by which students report on their PhD research progress are specified in Section 1.4.

1.6.3 The Qualifying Examination

1.6.3.1 Objectives and Format of the Qualifying Examination

Students will prepare, submit, and defend a research proposal on their PhD thesis research.

The Department's objectives in administering the Qualifying Examination are to determine whether:

- the student has a sound background knowledge in both molecular and cellular biology, and the area of specialization,
- the student has a demonstrated ability to integrate such knowledge into solving scientific problems, and
- the student has the ability and potential to pursue research appropriate for PhD studies.

Preparation for the Qualifying Examination affords an opportunity for students to study and integrate knowledge in solving scientific problems. It is hoped that this opportunity will allow students to approach their thesis research from a new and broader scientific perspective.

A member of the Graduate Studies Committee contacts those students scheduled to take the qualifying exam each semester to explain the Qualifying Examination objectives, formats and procedures. Students taking the Qualifying Examination may request information or clarification from the Chair of the Graduate Studies Committee or their Examination Chair at any time.

1.6.3.2 Scheduling the Qualifying Examination

The Qualifying Examination is completed before the end of the fifth semester (for students with an MSc) or the end of the seventh semester (for students without an MSc). The Qualifying Examination process is initiated at a meeting of the student with the Advisory Committee held no less than a semester in advance of the completion deadline. The Committee discusses the Examination with the student and prepares:

- a detailed assessment of the student's ability and potential to pursue research at the PhD level,
- recommendations regarding the timing and format of the Examination,
- recommendations for research areas for the research proposal (Option 2), and
- recommendations for membership of the Examining Committee (see specifications below).

The Committee's recommendations are submitted in writing to the Graduate Program Coordinator (or designate). This letter must be endorsed by all members of the Advisory Committee and contain information pertinent to the student's potential for PhD studies. At the same time, the student submits a brief written request for the Qualifying Examination to the Graduate Program Coordinator and may also indicate a general timeframe within the semester for the oral exam to take place.

1.6.3.3 The Qualifying Examination Committee

The Graduate Studies Committee appoints a student-specific, five-member Qualifying Examination Committee which includes:

- the Chair (a member of the Graduate Studies Committee)
- two members of the Advisory Committee (suggested by the Advisory Committee), only one of whom may be the Advisor or Co-Advisor
- two non-Advisory Committee members (suggested by the Advisory Committee)

Normally, at least one of the QE committee members is from outside the department. That person may be a member of the advisory committee.

1.6.3.4 The Qualifying Examination

Specific guidelines for the QE can be found on the pages that follow.

Normally, failure to submit the written component of the Qualifying Examination on or before the deadline will result in a failed attempt.

Ph.D. Qualifying Examination of [Student Name]
Thesis Research Proposal

Examining Committee:

[Name], Chair, Department of Mol. & Cellular Biology

[Name], Department of Mol. & Cellular Biology

[Name], Department of Mol. & Cellular Biology

[Name], Department of Mol. & Cellular Biology

[Name], Department

Research Proposal Topic: PhD thesis research topic.

Research Proposal Format and Content

The research proposal must include the following components:

- Title
- Abstract, including a statement of significance¹
- Lay summary²
- Background³
- Hypothesis and specific aims
- Progress to date⁴
- Proposed research⁵
- Anticipated outcomes, pitfalls, and alternative approaches
- Future directions⁶
- Bibliography⁷
- Figures and tables
- Timeline for completion⁸
- Acknowledgements⁹

The proposal should be no more than twenty pages (double spaced, 12 point), not including the title, abstract, lay summary, references, tables and figures, timeline, or acknowledgements.

Members of the department acknowledge that thesis research proposals are a complex mix of ideas from numerous sources. Please note however that neither the Advisor, nor members of the Examining Committee should read or comment on any QE proposal drafts, and that all questions regarding the Examination should be addressed to the Chair of the Examination Committee or the departmental Graduate Coordinator.

Notes:

1. The abstract should be no longer than a single page (double spaced).
2. A summary of the proposal suitable for public communication.
3. Emphasis should be given to the primary literature when describing the background to the project. While it may be useful to include a figure of the central process under investigation, in general you should limit the use of figures in this section of the proposal.
4. A summarized description of work completed to date. Submitted or accepted manuscripts (with documentation) and/or published reprints that contribute to this section should be appended.
5. Describe research that is in progress or still to be done in this section. In general, this section will likely reflect the actual work to be done for the thesis, but you should not feel restricted in proposing certain experiments because of (for example) a perceived lack of operating funds. For most students a three-year timeline will be appropriate for their remaining time in program.
6. This section is designed to capture some longer-term thinking about the project's trajectory; for example, what might the next student be doing after you graduate?
7. Include full references, including authors and title of the paper.
8. Append a five-year timeline indicating when each specific aim will be addressed.
9. Acknowledge the scientific contributions of others towards the progress made to date.

Proposal Submission Deadline: [4pm, date, two weeks before the scheduled exam date]

Please submit 5 printed copies of the proposal to [Exam Chair, (Room) or Graduate Admin, (Room)]

Also submit the proposal and any appended manuscripts as a pdf to [Exam Chair's email]

Note that appended manuscripts should only be submitted electronically, please don't print them.

Oral Examination: [Time, Date, Room]

The oral Qualifying Examination is not public. Individuals who wish to observe an oral examination must request permission from the Chair of the Examination Committee at least one week in advance. Permission is granted only with the agreement of the examinee.

The oral examination is based on the student's written submission and related topics. The student provides a short synopsis of the submission (approximately 20 minutes). Normally, this is followed by two rounds of questions from members of the Examination Committee (15-20 min/examiner). When the questions are completed the student and any observers leave the room. Each examiner presents an evaluation of the student's performance on both the written and oral components of the Examination. The supporting letter from the student's Advisory Committee is introduced and read by each examiner. The student's aptitude for the PhD program is discussed and each examiner indicates whether the student's performance in the examination and the research program is a satisfactory or unsatisfactory. The student passes the Qualifying Examination if there is no more than one negative vote (an abstention is considered as a negative vote). In exceptional circumstances where only one component of the exam (written or oral) is deemed unsatisfactory, the student may be given an opportunity to revise the proposal or to repeat the oral exam before the final outcome of the qualifying exam is decided. A written report on the examination is not required unless the Examination Committee chooses to communicate specific information or recommendations to the student.

If the student fails the examination, the Examination Committee recommends when the student should be allowed a second attempt (University regulations require that this be done within six months of the initial examination). The Chair of the Examination Committee prepares a written report on the student's deficiencies and suggestions for improvement. This report is conveyed to the student, the Advisory Committee, the Graduate Studies Committee and the Assistant Vice-President (Graduate Studies).). The same Examination Committee conducts the second examination. A second failure is reported to the Assistant Vice-President (Graduate Studies) and the student is required to withdraw from the PhD program. In consultation with their advisory committee, the student may request a transfer to the MSc program at this time.

1.6.4 The PhD Thesis Examination

A final oral examination, the PhD defense, is held after completion of the research and submission of the PhD Thesis (Section 1.7).

1.6.4.1 The Examination Committee

The Examination Committee is appointed by the Department Chair on the advice of the student's Advisory Committee and the Graduate Studies Committee. The Examination Committee includes:

- The Chair (normally a member of the Graduate Studies Committee who is not a member of the Advisory Committee),
- the External Examiner (at least two candidates should be nominated by the Advisory Committee),
- two members of the student's Advisory Committee; the Advisor or Co-Advisor may elect to sit on the Exam Committee, and
- a member of the graduate faculty, who is not a member of the Advisory Committee (at least two candidates should be nominated by the Advisory Committee).

According to the Graduate Calendar, the Department must choose an External Examiner who is a recognized expert in the subject of the thesis. The External Examiner must not have a direct connection with the Department. The External Examiner must not have served as Advisor to the student's Advisor, and must not have participated in joint projects with the Advisor. They may not have been a student or member of the graduate faculty in the University in the last 5 years. The External Examiner must have had

no direct connection with the student or the student's research project. The Advisory Committee must therefore specify any links (or lack thereof) with the nominated External Examiners when submitting nominations to the Graduate Program Coordinator. Assurance of independence of the External Examiner is taken as a very serious matter by the Board of Graduate Studies. Any individual who serves as an External Examiner may not serve again until a period of 3 years has passed.

The External Examiner submits a written report on the thesis in advance of the Final Oral Examination and participates in that examination. The report of the External Examiner is submitted to the Graduate Program Coordinator at least seven days prior to the examination. Copies of the report are normally made available to the Advisor and the Candidate once it becomes available.

1.6.4.2 The Examination

The PhD Examination is public. The examination begins with an oral presentation by the student which normally should last no more than 30 minutes. The student provides a brief introduction to the field of research and summarises the salient features of the research reported in the thesis. An opportunity is then provided for members of the University community to ask questions relevant to the presentation. This is followed by the examination of the thesis by the Examination Committee. No further questions from the audience are entertained during this examination.

The examination normally involves two (or more) rounds of questions from the Committee members. The Committee then meets in the student's absence to discuss and vote on the thesis and defense. If the thesis supervisor is present as an observer to the exam, it is expected that they will also absent themselves during the exam committee's deliberations. The thesis and defense are deemed satisfactory if the student receives no more than one negative vote (an abstention is considered as a negative vote). The Examination Committee communicates the result of the examination to the Department Chair, indicating whether any revisions to the thesis are required. The thesis is submitted to the Assistant Vice-President (Graduate Studies) when the revisions have been approved by the Examination Committee and the Department Chair.

1.7 PREPARATION AND SUBMISSION OF MSC AND PHD THESES

1.7.1 Overview

University regulations on thesis preparation and submission are available at:

<http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-thesis.shtml>

Each graduate student submits a thesis, expressed in satisfactory literary form, based upon his or her thesis research. The thesis must demonstrate the candidate's capacity for original and independent work. It should include a critical evaluation of work previously done in the candidate's field and emphasize new conclusions that may be drawn from the candidate's own research.

A PhD thesis is expected to make a significant contribution to knowledge in its field, and the student must explain that contribution in the thesis. The thesis must demonstrate mature scholarship and critical judgement on the part of the candidate. Approval of a PhD thesis implies that it is sufficiently meritorious to warrant publication in reputable scholarly media in the field.

Students prepare theses in close consultation with their research Advisors and Advisory Committees. A complete thesis draft that has been fully reviewed and revised by the student in consultation with the Advisor is submitted for review by the other Advisory Committee members. Theses containing incorrect grammar, syntax, punctuation, and spelling are not accepted for review by Advisory Committee members. The student submits a final thesis draft for examination only after responding to written comments provided by each Advisory Committee member.

The Examination Committee provides a final independent review of the thesis, and an objective and critical appraisal of the work described. The Examination Committee is independent of the Advisory Committee and, in the case of the PhD examination, the External Examiner is independent of the University of Guelph. The Examination Committee may declare a thesis unsatisfactory or require that a thesis be revised before acceptance.

Theses should describe research conceived and conducted by the student in consultation with his or her research Advisor. Where a student's thesis research has involved collaboration with other researchers, either at the University of Guelph or elsewhere, the contributions of others must be specifically identified. This identification of contributions made by others is particularly important for theses that are based on manuscripts co-authored by persons other than the student or the Advisor.

1.7.2 Advisory Committee Consultation

At an appropriate time towards the end of the research project the student submits a progress report that includes a tentative table of contents for the proposed thesis (often the 5th semester in the MSc Program, the 7th semester in the PhD program post-MSc or the 10th semester in the PhD program (post-BSc)). The thesis proposal is discussed with the Advisory Committee at a full Committee meeting. This discussion should result in:

1. recommendations concerning any further experimentation,
2. agreement concerning the thesis format and
3. a schedule for thesis completion.

This conversation is repeated in subsequent meetings if the student is not ready to begin thesis preparation.

The agreed thesis preparation schedule, discussed further below, must account for Departmental and University deadlines (for example, the last day to apply to graduate in a given semester without an application late fee and the last day to submit an approved (post-examination) thesis for convocation are specified in the Graduate Calendar) as well as other time commitments of the student and Advisory Committee members. Such commitments include undergraduate and graduate teaching, participation in research-related functions

such as the preparation and evaluation of research grant proposals and manuscripts, participation in scientific conferences, sabbatical leaves and vacations. **At least two weeks must be allowed for each review of a complete thesis draft by a faculty member.** The Advisory Committee formulates a plan to accommodate commitments that will prevent Advisory Committee members from reviewing a thesis draft within a reasonable time. Such a plan should be submitted in writing to the Graduate Program Coordinator for approval by the Department Chair.

1.7.3 Thesis Preparation and Advisory Committee Review

Students inform the Graduate Program Coordinator of the semester in which they expect to submit a thesis for examination. Thesis drafts are prepared and revised by the student in close consultation with the Advisor. Drafts which satisfy the student's standards are reviewed by the Advisor who makes corrections and suggestions for improvement. The student corrects and revises thesis drafts until the two agree that the thesis is ready for appraisal by other Advisory Committee members.

The student submits a complete thesis draft to each member of the Advisory Committee and informs the Graduate Program Coordinator of this action. Each Committee member reviews the thesis as she or he would review a manuscript submitted for publication, providing written suggestions for alteration or correction of the thesis and discussing those proposed changes with the student. **At least two weeks are allowed for each review of a complete thesis draft by a faculty member.**

1.7.4 Thesis Submission and Examination

When the student is satisfied that the thesis is ready for examination and the Advisory Committee members have reviewed the final draft, the student and members of the Advisory Committee complete the Examination Request Form. Advisory Committee members indicate whether they do or do not find the thesis to be ready for Examination. Their signatures do not indicate approval or acceptance of the thesis, since the question of approval or acceptability is the prerogative of the Examination Committee. The Advisory Committee must provide a written explanation for failure of any Advisory Committee member to complete the Examination Request Form. At this time, the Advisory Committee submits its recommendations regarding selection of the External Examiner (PhD only) and membership of the Examination Committee (see Sections 1.5 and 1.6). The student submits the completed Examination Request Form to the Graduate Program Assistant and emails a pdf file of the thesis to the Graduate Program Coordinator. The External Examiner must receive the thesis no less than 4 weeks before the defense.

Note that the Department of Molecular and Cellular Biology will make printed copies of the thesis for examiners, if required.

Preparation of a thesis can take from a few weeks to several months. Students who leave campus to take other positions before the thesis is complete usually encounter delays. The last date on which an approved (post-examination) thesis and an application to graduate may be submitted for convocation within a particular semester is specified in the Graduate Calendar (see I. Schedule of Dates). Usually this date is on (or very close to) the opening day of the semester.

Each semester the Graduate Program Coordinator assists students and their Advisory Committees by announcing the last day to apply to graduate in the current semester without an application late fee and the last day to submit an approved (post-examination) thesis for convocation in the following semester, as specified in the Graduate Calendar.

Students must register and pay fees during the semester in which they submit an approved thesis, defend it and apply for graduation. Students who complete the requirements for their degree program early in a semester may apply for a partial rebate of fees. The rebate is pro-rated according to the date of completion. Information regarding this option can be obtained from the office of the Assistant Vice-President (Graduate Studies). In order to qualify for a rebate, a student must have been registered in the preceding semester.

In the schedule for thesis submission outlined in Table 1.1, the Examination date is designated as "E". This schedule is based on maximally efficient handling of well-prepared theses. It does not take into account delays that will arise if Advisory Committee members identify serious deficiencies in submitted thesis drafts.

Table 1.1: Schedule for Submission of MSc and PhD Theses

Date/Period (approximate)		Activity
MSc	PhD	
E minus at least 1 semester		A schedule for thesis preparation, review and submission is agreed upon by student and Advisory Committee. Student begins writing thesis.
Early in completion semester		Student applies to graduate in this semester without a late fee. This application can be carried forward if the student does not graduate until the following semester.
		Student writes and Advisor reviews thesis draft(s). Advisor provides suggestions for revision. Student revises thesis draft(s).
E – 8 to 9 weeks	E – 10 to 12 weeks	Student submits thesis to Advisory Committee members for review and informs the Graduate Program Assistant that they have reached this stage. For the PhD, Advisor submits Advisory Committee nominations for External Examiner to the Graduate Program Coordinator. At least two weeks are allowed for thesis review by Advisory Committee members.
		Advisory Committee members return the thesis to the student with their written comments, discussing the comments with the student as necessary. Student revises the thesis. Delays occur at this stage if thesis drafts are unsatisfactory.
E – 5 to 6 weeks	E – 7 to 8 weeks	Advisory Committee members complete the Examination Request Form. Student submits Form to Graduate Program Assistant and a pdf of the exam-ready thesis to the Graduate Program Coordinator. Advisor submits Advisory Committee recommendations regarding Examining Committee membership to the Graduate Program Coordinator.
E – 2 to 3 weeks	E – 4 to 5 weeks	Graduate Program Coordinator appoints Examining Committee on behalf of the Department Chair. Department prints appropriate number of copies of the thesis. The thesis is distributed to Examining Committee members, as requested. Examination time and place are set.
	E – 1 week	The report of the External Examiner is submitted.
E		MSc/PhD Examination takes place. Examiners judge thesis and defense to be satisfactory or unsatisfactory and designate an Examiner as reviewer of any changes to satisfactory theses required by the Examination Committee.
E + 1 (or more) weeks		Student completes thesis revisions and approved thesis is submitted, with application to graduate, to the Assistant Vice-President (Graduate Studies)
Deadline Date Specified in Calendar		Approved thesis is submitted, with application to graduate, to the Office of the Assistant Vice-President (Graduate Studies). Thesis is reviewed and accepted by the Office of the Assistant Vice-President (Graduate Studies).
		Board of Graduate Studies presents lists of graduands to Senate for approval.
		Convocation!!!

1.7.5 Thesis Format

University specifications regarding the thesis format are provided here:

<http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-thesis.shtml>

The Faculty of Graduate Studies accepts theses either in monograph or manuscript format. The organization of the thesis should be agreed upon at a full Advisory Committee meeting. The editorial format may be derived from any recognized, refereed scientific journal appropriate to the subject matter.

1.7.5.1 Monograph Format

A thesis written in monograph format organizes chapters around a central problem, for instance, with an Introduction/Literature Review and chapters on Methodology, Results, and Conclusions.

Introduction A critical review of the pertinent literature with an introduction to the research rationale and outcomes. No specific page requirements are set but a thesis introduction is usually more comprehensive than the introduction to a published research article. The introduction may be related to but is unlikely to correspond with the Literature Review and proposal submitted for courses MCB*6100/MCB*6200.

Materials and Methods Descriptions of the methods used in the research that is sufficiently complete for a qualified researcher to duplicate the experiments. Modifications of standard procedures should be described in full. The source of the materials used in the study should be indicated as necessary.

Results The research results are presented and documented by data included in figures and/or tables. Descriptions of the research results should include the rationale or design of experiments performed as well as their results, but the student should reserve extensive interpretation of the results for the Discussion.

Discussion Interpretation of the results in relation to previously published work. This should be a scholarly treatment analyzing the experiments performed, discussing reservations in the interpretation of the results and stating the significance of the work relative to the research field.

References Regardless of the journal used as the model for thesis preparation, references must include complete titles as well as first and last pages.

Appendices Appendices can be used to provide supplemental material, such as extra detail on methods, data that did not "fit" into the thesis or was part of an incomplete project, or data that were not included in published manuscripts on which the thesis is based (see thesis organization, below).

1.7.5.2 Manuscript Format

In the manuscript format, the chapters treat separate elements of the research program, typically incorporating several discrete articles suitable for journal publication. Theses written in manuscript format may include published articles, submitted articles and unpublished work in publication format. Theses written in manuscript format must include connecting materials that integrate across the different chapters/articles, including at minimum an overarching introduction, a concluding discussion chapter and a single, integrated reference list. To avoid repetition, all methods should be presented in a single methods chapter if the same techniques were used to produce data presented in different chapters. The student must be the principal or sole author of any included manuscripts and must have had a major or sole role in the design of the research, and the preparation and writing of the manuscripts. The efforts of all contributors to the research must be explicitly acknowledged. *Publication or acceptance for publication of research results before presentation of the thesis in no way supersedes the University's evaluation and judgement of the work during the thesis examination process.*

1.7.5.3 Thesis Printing and Electronic Submission

The University of Guelph requires the electronic submission of all theses. Electronic theses are commonly referred to as ETDs. Theses are deposited and accessible in the University's institutional repository known as the Atrium. Instructions for electronic submission are available at:

<http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-thesis.shtml>

All theses will be published and made available on the World Wide Web through the Atrium. Students are no longer required to submit a bound copy of their thesis to the University of Guelph or the Department of Molecular and Cellular Biology. Each student is required to deliver a bound copy of the thesis to their Advisor.

2.0 GRADUATE COURSES

[Degree Program Form](#)

2.1 GRADUATE COURSE REQUIREMENTS, POLICIES AND PROCEDURES

MSc students in Molecular and Cellular Biology must complete MCB*6500 (MSc Research Topics in Molecular and Cellular Biology) and participate in the annual Grad Symposium. PhD students must complete MCB*7500 (PhD Research Topics in Molecular and Cellular Biology) and participate in the annual Grad Symposium. MSc students, and PhD students who enter their program without an MSc in molecular and cellular biology or an equivalent discipline, are required to take an additional course with at least 0.5 graduate course credit (a total of 1.5 credits). Students may be required to take additional courses as determined on an individual basis in consultation with their Advisory Committees. Students who transfer directly from the MSc to the PhD program are not required to take MCB*7500 as they will have completed MCB*6500.

Courses other than MCB*6500/*7500 are selected in consultation with the Advisory Committee and students must receive authorization for the chosen course program from the Advisory Committee. The course requirements must be established *no later than the student's second semester of registration* through submission of the Graduate Degree Program form, which is endorsed by the Graduate Program Coordinator and kept in the student's file.

2.2 OVERVIEW OF GRADUATE SEMINAR AND COURSE OFFERINGS

Graduate courses offered by the Department of Molecular and Cellular Biology are listed in Table 2.1 and described in Section 2.3. Additional courses may also be appropriate for specific graduate degree programs as approved by particular Advisory Committees. Senior undergraduate courses may be prescribed to fill gaps in student knowledge, but undergraduate courses are not accepted for graduate course credit.

Most graduate courses are offered only during fall or winter semesters. Courses MCB*6500 and MCB*7500 are offered every semester. Other course offerings are contingent on student enrolment. Students and Advisors are canvassed in July of each year to determine the demand for each course. Scheduling is designed accordingly and may differ from that indicated in Table 2.1.

Table 2.1: Graduate Courses Offered through the Department of Molecular and Cellular Biology

Number	Course Name	Semester
MCB*6310	Advanced Topics in Molecular & Cellular Biology	F
MCB*6370	Protein Structural Biology & Bioinformatics	F or W
MCB*6500 ¹	MSc Research Topics in Molecular and Cellular Biology ¹	F, W, S
MCB*7500 ¹	PhD Research Topics in Molecular and Cellular Biology ¹	F, W, S
BINF*6110	Genomic Methods for Bioinformatics	W
BIOT*6500	Molecular Biotechnology	F
BIOT*6700	Communication in Science and Business	W

¹ Two-semester course

2.3. GRADUATE COURSES

2.3.1 MCB*6500 MSc Research Topics in Molecular and Cellular Biology [1.0] and MCB*7500 PhD Research Topics in Molecular and Cellular Biology [1.0]

Courses MCB*6500 and MCB*7500 provide MSc and PhD students the opportunity to develop and refine their skills in scientific writing and communication. The emphasis is on writing skills in the context of developing a thesis proposal. Students must register for either course in their first and second semesters of study. **Note that registration must be renewed for the second semester for any two-semester course.**

Each student will **complete** the Literature Research Tools Assignment in **the first three weeks of their first semester**. Students will be provided with a research article that is relevant to their research project and published at least five years previously. Students then analyze the article as outlined in the online Literature Research Tools website and write a report.

Following completion of the Literature Research Assignment, each student prepares a literature review consisting of an introduction to the student's area of research, a detailed description of the significance of the research and a discussion of relevant background literature focused on key experiments leading to the student's proposal. The research proposal consists of a clear hypothesis, specific objectives, experimental approaches and anticipated outcomes. This document is prepared under the guidance of the Advisor and members of the Advisory Committee.

For MCB*6500, the literature review should be approximately 15 pages in length, followed by a maximum of 5 pages of research proposal. For MCB*7500, the corresponding page limits are 20 and 10, respectively. These page limits do not include references, tables and figures. References must be cited in the text by author name and publication year (e.g. Smith, 2010; Smith and Jones, 2010 or Smith *et al.* 2010). References must be fully listed in the reference section, including titles. The emphasis in this course is on understanding of the current literature and development of the research proposal. Thus students are not expected to present preliminary data from the thesis research.

The literature review and research proposal are evaluated as indicated below and the final grade is obtained as follows:

- i) each member of the Advisory Committee evaluates the literature review and research proposal, and submits a grade independently to the Course Coordinator;
- ii) a panel of faculty members is assigned to grade submissions in each semester. Two members of this panel evaluate the literature review and research proposal and submit a grade;
- iii) the averaged grade from the Advisory Committee and the two grades from the course instructors are averaged to obtain the final course grade;

If there is more than a 10% discrepancy between any pair of submitted grades, all evaluators meet to resolve the difference.

See the current course outline for specific details and schedule of dates.

Courses MCB*6500 and MCB*7500 also provide graduate students the opportunity to develop and refine their skills in scientific communication, with a particular emphasis on oral presentation. Each student presents a public seminar of approximately 30 minutes based on his/her written literature review and research proposal. Students prepare their seminars using PowerPoint under the guidance of their Advisors.

Students complete the seminar in their second semester. Seminars are scheduled each Friday between 12 noon and 1:30 pm in SSC1511. One to two months before the beginning of the relevant semester, students consult their Advisory Committee members and Graduate Program Assistant Bertilla Moroni (SSC4480) to obtain a seminar date and time that accommodates all schedules. Each student must submit the seminar

title and an abstract (maximum 250 words) to Bertilla Moroni (bmoroni@uoguelph.ca), before 4 pm on the Wednesday 9 days prior to the seminar date. A 5% penalty will be applied for late submission of this information.

All students are required to attend all seminar presentations during the semesters they are enrolled in these courses. Attendance is recorded and failure to attend any class must be discussed with the Course Coordinator.

Seminars are evaluated as described below and the final grade is obtained as follows:

- i) a panel of four faculty members is assigned to grade the seminars for each semester; normally two members of the panel will grade each seminar;
- ii) additional faculty members are recruited as appropriate to evaluate the seminars;
- iii) all individual marks are averaged to compute the final course grade;
- iv) if there is more than a 10% discrepancy between any pair of the submitted grades, the course instructor contacts all markers to formulate the final grade.

See the current course outline for specific details and schedule of dates.

2.3.2 Other Courses

Course descriptions follow. Specific course outlines, including details of course format, are available online and at the first class meeting in each course.

MCB*6310 Advanced Topics in Developmental and Cellular Biology F [0.50]

This course will consider fundamental cellular processes from multiple perspectives: biochemistry, cell biology, microbiology, molecular biology and genetics, and plant biology. Topics will vary from semester to semester but a multi-disciplinary approach to advanced concepts and experimental strategies will be a common theme.

MCB*6370 Protein Structural Biology and Bioinformatics U [0.50]

This course explores structural biology from three perspectives: 1) the fundamental concepts in structural biology; 2) the methods used to determine structures (including x-ray crystallography, NMR, electron microscopy, and computational modeling); 3) the bioinformatic concepts and tools used to compare, contrast and assign biochemical function to protein structures and sequences. The course emphasizes building a conceptual and practical skill set that will be applicable to any structure related problem.

BINF*6100 Genomic Methods for Bioinformatics W [0.50]

This course provides an introduction to current and emerging methods used to generate genomic data analyzed in bioinformatics. This may include techniques for DNA sequencing as well as transcriptome, proteome and metabolome analysis. The objective is to develop an appreciation for the challenges of producing data.

BIOT*6500 Molecular Biotechnology F [0.50]

This course will provide an overview of molecular approaches relevant to a broad range of biotechnology industries including those found in medical, microbial, protein, pharmaceutical, environmental and agricultural fields.

BIOT*6700 Communication in Science and Business W [0.50]

The goal of this course is to develop written and oral presentation skills to effectively communicate ideas and experiments in both scientific and business contexts. Students will be asked to write and orally communicate a research proposal.

3.0 FINANCIAL SUPPORT, SCHOLARSHIPS AND AWARDS

3.1 FINANCIAL ASSISTANCE

Graduate Studies provides estimates of the cost of living for graduate students in Guelph, including tuition, fees and living expenses:

<https://www.uoguelph.ca/graduatestudies/future/cost>

Each graduate student's stipend is derived from up to three sources: a Graduate Research Assistantship (GRA), a Graduate Teaching Assistantship (GTA), and Scholarships (Table 3.1).

GRAs are derived from research funding obtained and administered by student Advisors. Continuation of GRA support is based on a satisfactory academic performance, as determined by the student's Advisory Committee.

Students gain valuable teaching experience while participating in the undergraduate program as Graduate Teaching Assistants. Each student is entitled to GTA support, subject to satisfactory performance, during the period prescribed in the letter offering admission to the graduate program. This period is normally 1 GTA unit per year for each of two years in the MSc program or three years in the PhD program.

GTAs constitute an essential part of the stipend for students without scholarship support (Table 3.1). Students are notified of GTA positions available each semester and must apply for these positions. A few students apply for and are assigned additional GTA units. This constitutes additional funding to graduate students and does not reduce the amount of GRA support.

Assuming a satisfactory job performance is maintained, GTAs are awarded to students based upon availability, qualifications and levels of consideration (terms and conditions are outlined in the Collective Agreement between CUPE, Local 3913, Unit #1 and the University of Guelph).

Scholarships are available from a variety of sources, outlined in Section 3.2.

The minimum stipends for graduate students in Molecular and Cellular Biology are summarized in Table 3.1. The minimum guaranteed durations of support are 6 semesters for MSc students, 12 semesters for PhD students who enter the PhD program with an MSc degree or directly from a Bachelors (Honours) degree, and 15 semesters for students who transfer from the MSc to the PhD degree program. Faculty may and often do choose to support students beyond these periods.

3.2 SCHOLARSHIPS AND AWARDS

The Graduate Studies Committee serves as the screening and/or selection Committee for most scholarships and awards commonly held by graduate students in Molecular and Cellular Biology. Those most frequently held are listed in Table 3.2. Additional scholarships and awards, handled on an *ad hoc* basis, include the Trillium Doctoral Scholarships, NSERC and CIHR Vanier Canada Graduate Scholarships, the China Government, OMAFRA, Brock Doctoral, Cebotarev, Forster, ICI Scholarship, Nilsen, Thompson and Winegard awards. Private foundations may also provide support for research on particular topics. They include the Canadian Cystic Fibrosis Foundation (CCFF), the Heart and Stroke Foundation (HSF), the Kidney Foundation of Canada (KFC) and the Multiple Sclerosis Society (MSS). Student Advisors serve as primary sources of information on eligibility and application procedures for these awards.

Additional institutional scholarships are listed here:

<http://www.uoguelph.ca/registrar/calendars/graduate/current/gradawards/index.shtml>

Table 3.1 Policy on Graduate Student Support, Department of Molecular and Cellular Biology^a

STUDENT		ANNUAL FUNDING (\$)					
Status	Scholarship(s) Held ^b	Award/Degree ^b	Scholarship	GTA ^c	GRA	TCS	Total
Domestic	NSERC	Master's CGS-M	17,500	5,838	N/A	5,000	28,338
		Doctoral PGS-D	21,000	5,838	N/A	5,000	31,838
		Doctoral CGS-D	35,000	5,838	N/A	5,000	45,838
	CIHR	Master's CGS-M	17,500	5,838	N/A	5,000	28,338
		Doctoral CGS-D	35,000	5,838	N/A	5,000	45,838
	Ontario	OGS (Master's)	15,000	5,838	^d	-	^d
		OGS (Doctoral)	15,000	5,838	^d	-	^d
		QEII (Master's)	15,000	5,838	^d	-	^d
		QEII (Doctoral)	15,000	5,838	^d	-	^d
	Minor Scholarship(s)	Master's	variable			^e	^e
		Doctoral	variable			^e	^e
	None	Master's	N/A	5,838	15,334	-	21,172
Doctoral		N/A	5,838	19,334	-	25,172	
International	Scholarship(s)	Master's	variable	5,838	^f	-	^f
		Doctoral	variable	5,838	^f	-	^f
	None	Master's	N/A	5,838	15,334	-	21,172
		Doctoral	N/A	5,838	19,334	-	25,172

^a Effective F2017 for all new students. Note that these numbers do not supersede individual funding letters.

^b Scholarship acronyms are defined in Table 3.2 and on the agency web sites. Holders of NSERC or CIHR Scholarships also receive a Tri-Council Scholarship top-up (TCS) of \$5,000. This is reflected in the listed Total stipends.

^cGTAs constitute an essential part of the stipend for students without scholarship support. Each student is entitled to GTA support, subject to satisfactory performance, during the period prescribed in the letter offering admission to the graduate program. This period is normally 1 GTA unit per year for each of two years in the MSc program or three years in the PhD program. GTAs are awarded via a competitive process administered by each academic Department in which GTA appointments are available. The GTA compensation rate is set by Collective Agreement.

^d GRA for students with a OGS or QEII award is at the discretion of the faculty advisor; however, the total annual stipend must be at least \$2,000 more than the **minimum** stipend.

^e Scholarships with a combined value of up to \$2,000 in a given year do not affect the value of GRA support provided to students. Students with larger scholarships may have their GRA reduced.

^f GRA for international students with a scholarship(s) is at the discretion of the faculty advisor; however, the total annual stipend will not be less than the minimum stipend .

Please refer to the CBS-ADR website <https://www.uoguelph.ca/cbs/student-stipend-information>

Graduate Award Search Tool <https://www.uoguelph.ca/registrar/studentfinance/apps/gawards>

Table 3.2 Scholarships Available to Graduate Students in Molecular and Cellular Biology

Scholarship	Funding (\$)	Criteria	Deadline and Contact
Graduate Excellence Entrance Scholarships	\$15,000 (MSc) \$30,000 (PhD)	Applicants to the graduate program who have not yet received a placement offer. Eligible applicants will be a Canadian citizen or permanent resident at the time of application, have submitted an OUAC application for a full-time program, and have a minimum of an 85% average	Spring Assoc. Dean Research
Graduate Tuition Scholarship	\$8,000 per year	Applicants to the graduate program who have not yet received a placement offer. Eligible applicants will be a Canadian citizen or permanent resident at the time of application, have submitted an OUAC application for a full-time program, and have a minimum of an 75% average	Spring Assoc. Dean Research
Ontario Trillium Scholarships	\$40,000 per year	Entry-level doctoral scholarships for international students. Eligible applicants must have at least an 'A-' average (first-class standing) in each of the last two years of full-time study. Candidates are nominated by the Department.	Spring Assoc. Dean Research
International Graduate Tuition Scholarship	\$9,000 per year	A single nomination process with the Ontario Trillium Scholarships	Spring Assoc. Dean Research
Natural Sciences and Engineering Research Council of Canada (NSERC)	\$17,300 – \$35,000 per year	Entry-level and continuing master's and doctoral scholarships. Eligible applicants must have at least an 'A-' average (first-class standing) in each of the last two years of full-time study.	Fall Graduate Program Assistant Bertilla Moroni
Canadian Institutes for Health Research (CIHR)	\$17,500 – \$35,000 per year	Entry-level and continuing master's and doctoral scholarships. Eligible applicants must have at least an 'A-' average (first-class standing) in each of the last two years of full-time study.	F (PhD) / W (MSc) Graduate Program Assistant Bertilla Moroni

Table 3.2 cont.

Ontario Graduate Scholarships (OGS)	\$15,000 per year	Entry-level and continuing master's and doctoral scholarships. Eligible applicants must have at least an 'A-' average (first-class standing) in each of the last two years of full-time study or equivalent part-time study, as of the September of application.	Fall Graduate Program Assistant Bertilla Moroni
QEII Scholarships	\$15,000 per year or \$5,000 /semester	Graduate studies in science and technology. Full-time Canadian citizens or permanent residents with a first class standing in each of their last two years. Successful candidates are selected on the basis of grades, research, communication and leadership.	Fall Graduate Program Assistant Bertilla Moroni
Ontario Graduate Fellowships	\$3,000 /semester	Entry-level and continuing master's and doctoral scholarships. Eligible applicants must have at least an 'A-' average (first-class standing) in each of the last two years of full-time study. Candidates are nominated by the Department	
Dr. Donald Robert Phillips Molecular Biology and Genetics Scholarship	\$4,250	Two awards per year for contributions to research.	February 28 Assistant to the Chair, Laleh Hatefi
The Pharmacia Molecular and Cellular Biology Graduate Scholarship	\$500	Best poster presented at a scientific meeting during the academic year. Posters must be exhibited by the student or designate during the last week of August.	August Assistant to the Chair, Laleh Hatefi
Roche Molecular Biochemical Award of Excellence	\$500	MCB student who has presented the best graduate seminar during the academic year.	April Graduate Students
CGS-<i>Foreign Study Supplement</i>	\$6,000	For holders of some NSERC and CIHR Scholarships	Assistant Vice-President (Graduate Studies)