# Biology Graduate Program

# Memorial University of Newfoundland

# Guidelines for Students and Supervisors

# 2024

Compiled by John Gow PhD., Biology Graduate Officer 2000-2003
Revised by Patrick Dabinett PhD., Biology Graduate Officer 2004-2005
Revised by Paul Snelgrove, PhD., Biology Graduate Officer 2005-2006
Revised by Edward Miller, PhD., Biology Graduate Officer 2006-2022
Revised by Andrew Lang and the BGSC, February 2024

# Contents

## A. Foreword

The Biology Graduate Program includes studies in a wide range of biological disciplines within the department and encompassing the collegial collaboration of its members in various branches of the university including the Department of Ocean Sciences and the Marine Institute, as well as government agencies such as the federal departments of Fisheries and Oceans, Environment and Climate Change Canada, Parks Canada, and Agriculture and Agri-Food Canada and the provincial Department of Fisheries, Forestry and Agriculture. It is administered by the Biology Graduate Studies Committee (BGSC) at the departmental level, which is chaired by the Deputy Head (Graduate Studies), and operates under specified "Terms of Reference". They serve the Head of Biology and work under the guidance and regulations of the Dean of the School of Graduate Studies (SGS). In cases where the Deputy Head (Graduate Studies) is in conflict (e.g., a supervisor or supervisory committee member) departmental signing and approval authority rest with the Head.

This Guide presents a general outline of the administrative requirements of the Biology Graduate Program as well as other information that will be useful for students and supervisors. **It includes examples of forms that may be needed by supervisors and students to provide information required to administer the program.** Corrections and suggestions for changes and additions are welcome. If you have one or more questions that you feel are not answered in the guidelines, please contact the Academic Program Assistant for Biology (biogradsec@mun.ca).

**Note: These are guidelines only to the regulations and procedures published in the Memorial University Calendar**. Current SGS procedures and regulations are available at the SGS website.

## B. Some useful websites and contact information

| | |
|---|---|
| Memorial University | http://www.mun.ca |
| School of Graduate Studies | http://www.mun.ca/sgs |
| Biology Department | http://www.mun.ca/biology |
| | |
| School of Graduate Studies | sgs@mun.ca |

| | |
|---|---|
| Academic Program Assistant Phone Number | 864-7498 |
| Biology Department Fax Number | 864-3018 |
| Campus Enforcement Phone Number (Emergency Only) | 864-4100 |

There are a variety of supports available for graduate students. Please see: https://www.mun.ca/sgs/current-students/resources-for-graduate-students/.

## C. Introduction to the scope of the Biology program and application procedures

The degrees of Master of Science (MSc) and Doctor of Philosophy (PhD) are offered in Biology. The Biology graduate program includes faculty appointed to Biology as well as cross-appointees from other units at Memorial. In addition, Adjunct Faculty can co-supervise students. Details about the research interests of supervisors are available at the Web site http://www.mun.ca/biology. **Prospective students should make initial contact with potential supervisors prior to submitting a full application to determine whether there is mutual interest**. Application to the program is made through the SGS, specifying the Department of Biology and the degree sought, along with the appropriate academic transcripts, two reference letters, and English proficiency result, if applicable. Application is made via http://www.mun.ca/sgs.

**There is currently no formal application deadline, but applications need to be submitted well in advance of the targeted start date so that everything can be processed in time.**

## D. Processing an application

When an application is received by the School of Graduate Studies for Biology it is forwarded to the Department. Copies of references, transcripts and English proficiency results (where required) are dated and forwarded to Biology as they become available. In Biology, the files are checked on a regular basis to determine when the file is complete. A file can proceed once transcripts and two letters of reference are received. The BGSC evaluates the applicant's materials once a "New Students - Supplementary Form" has been submitted by the prospective supervisor. The file is evaluated to determine if the applicant meets the academic requirements. If approved for admission by the BGSC, the supervisor will complete the "Program of Graduate Studies Form" and submit it to the Academic Program Assistant for signature by the Deputy Head (Graduate Studies) and submission to SGS to request that the applicant be admitted to the program. The Department has minimum funding levels for MSc and PhD students (see Graduate Support Section below). Financial support can come from a variety of sources as outlined below.

Applications where there is no prospective supervisor identified are kept in the Department for faculty to evaluate if they are looking to recruit a new student. If no interest is shown by faculty members, the file may be closed. When an application is closed, the applicant is notified.

The Dean of Graduate Studies will review the recommendation and, if in agreement, will send the applicant a **letter of acceptance** outlining the program with regard to Department, supervisory committee and financial support.

International students require the letter of acceptance from the Dean when applying for a Study Permit/Visa to attend university in Canada.

The applicant can accept or reject the offer made by the Dean of Graduate Studies.

**Note:** Graduate students are required to pay fees until the thesis and other program requirements are complete. That is, until the corrected thesis is submitted to, and accepted by the School of Graduate Studies, fees must be paid on a semester basis. The same applies if there are other outstanding requirements.

**Visiting graduate students**

Graduate students visiting to undertake collaborative research as part of their graduate programs elsewhere should register as "Visiting Graduate Students" with SGS. Details are available on their website: https://www.mun.ca/sgs/current-students/visiting-graduate-students/.

## E. Graduate student stipend support

Currently, the Department has set $21,650.40 (MSc) and $23.150.40 (PhD) per annum as minimum support levels for students. This support is guaranteed for two years for the MSc program and four years for the PhD program. Students who start in the MSc program and then transfer to the PhD program are eligible for 5 years of support. Funding beyond this time-frame is at the discretion of those providing the funds. SGS basleine contributions terminate at the end of two years for MSc and four years for PhD students (with exception of transfers as indicated above).

There are a variety of mechanisms by which students are supported. Students may hold external fellowships from NSERC and Memorial University. They are typically partially supported by SGS Baseline Funding, teaching assistantships and their supervisor's grants or contracts.

The Department may be able to approve SGS baseline funding and teaching assistantships. The baseline funding budget comes from SGS and is allocated through deliberation of the BGSC. Students must have a minimum of a 75% cumulative average based on undergraduate and graduate transcripts to be eligible for baseline funding. Baseline funding is currently at $10,500 per annum for MSc students and $12,000 per annum for PhD students. Students may apply for teaching assistantships which are currently allocated in units of $1,495.80. Each unit is typically the teaching of one laboratory section, plus preparation and marking for one semester (60 hours). Allocations of up to 4 per year, for a total of $5,983.20, are normal from this source.

Full-time students cannot work more than 24 hours per week at a job. If a student works more than this, they are considered to have a full-time job and the program must be changed from full time to part time using a **Change of Status** form. The most up-to-date rules surrounding working while in-program will be here: https://www.mun.ca/sgs/current-students/financial-support/.

**Note**: Funding is administered through the Biology Department because the Department must assemble the total payment for each student, per semester, on a form with grant and item numbers.

International students should use this site to find information on additional requirements for their study at Memorial: https://www.mun.ca/international/arrivals/.

## F. Requirements of the student upon arrival at Memorial University and procedures for registration and getting on the payroll

1.You will need the following:
• Social Insurance Number from the Canadian Government (all students)
•Direct Deposit Form (all students)
• Student Visa (international students)
• Work Permit (international students)

These documents are needed by the Biology Department and SGS to ensure students' pay can be processed.

2. International students should be sure they are familiar with the additional requirements for their admission, pay, etc. The best resource for the most up-to-date information will be SGS (https://www.mun.ca/become/graduate/international-students/) and the Internationalization Office (https://www.mun.ca/international/).

3. All students must register by online registration (Memorial Self Service). The information on this procedure is part of the package sent out by the School of Graduate Studies with the acceptance letter. SGS will not process the payroll paperwork for any student who is not registered and it is therefore advisable to register as soon as possible.

4. Graduate students who wish to have their tuition paid from their bi-weekly financial support the student must request the service online through Memorial Self Service each semester. **This needs to be done before the semester begins**. In such cases, your semester program and ancillary fees will be allocated over the number of pay periods available within a given semester and will be deducted from your bi-weekly support.

5. The bi-weekly pay will be automatically deposited in the student's bank account by filling out a Direct Deposit Form. The student can go under Self Service to check for a record of deposit each payday.

5. If an international student has been admitted to SGS based on an English proficiency test, the student must do the English Language Placement Test. The information about this test will be included in the package sent from the School of Graduate Studies. If not received, check with the Department of Biology upon arrival.

## G. Guidelines for general procedures to enter the graduate program

## G.1. Responsibilities of the supervisory committee

1. A supervisory committee (SC) shall be appointed for each student. The SC shall consist of the supervisor (or co-supervisors, as appropriate), and sufficient other members to provide the appropriate expertise to help ensure the student's successful progression through their program. The SC must have at least 2 members (i.e., supervisor and one other), but a total of 3 members is typical. SC members can be regular or adjunct faculty at Memorial, faculty at other universities, government agency scientists, etc. Postdoctoral fellows are not appropriate SC members.

2. The SC shall forward its reports and recommendations to the Dean via the Deputy Head (Graduate Studies).

3. The functions of the SC are to:
• decide, in consultation with candidate, the program of study, the subject of research, and the title of the thesis, and to recommend these to the Deputy Head (Graduate Studies) for approval by SGS
• monitor the candidate's progress in their courses and research program
• report at least annually to SGS on the candidate's progress and advise on the student's continuation in the program
• recommend, after consultation with the candidate, necessary changes in the program of study, the subject of research, or the title of the thesis
• recommend the timing of the comprehensive examination (for PhD students)
• report that the thesis is ready for examination by completing the appropriate form, which is to accompany the thesis upon its submission to SGS
• recommend appropriate thesis examiners

## G.2. Responsibilities of supervisors and graduate students (as approved by the Academic Council of SGS, September 2016)

The fundamental principle underlying this statement of responsibilities between students and faculty is that there must be mutual respect governed by high standards of professional integrity and ethics. These written guidelines are meant to identify, at a high level, guiding principles that can apply to all graduate supervisors and students to help both supervisors and students create and maintain a successful relationship, but are not meant to replace student-supervisor communication.

https://www.mun.ca/sgs/media/production/memorial/academic/school-of-graduate-studies/school-of-graduate-studies/media-library/responsibilities.pdf

## G.3. Questions and issues that should be addressed by supervisors and students at the beginning of a program

**Note:** Some of what follows may include issues already addressed under the SGS Responsibilities of Supervisors and Graduate Students.

1. What is the nature of the research proposed, the funding for the research, and the timetable for doing the work? This is critical in large interactive research programs where timing of research may be critical (sea voyage, seasonal cycles, breeding periods, etc.) and funding may be time-limited. Two aspects then need to be assessed: (a) what is the probability of obtaining any needed data within a given time frame and (b) what are the funding prospects if the data collection period must be extended? The goal should be to limit the time taken in MSc programs to two years and PhD programs to four years, with longer periods being the exception rather than the rule for full-time students.

2. Questions concerning use and ownership of the data being collected by the student or provided to the student for analysis and its publication should be addressed. This may arise from contract research or if data are obtained from other agencies or companies. All rights and ownership should be known, and agreements on its use specified in writing so that no misconceptions arise. A student has the right to use all data that they have collected or compiled, unless a different arrangement is made using a contract signed by all parties concerned. Memorial has a full policy on intellectual property: https://www.mun.ca/policy/browse-or-search/browse-policies/university-policy/?policy=345.

3. The protocols that will be used with respect to publication should be made clear from the start of a project. Will work be multi-authored with other researchers? It is the goal of the program that all thesis research ultimately results in publications in refereed journals, however this is not always the case and is not a requirement for completion of a graduate program. Unless otherwise agreed to, it is normal practice for the student and supervisor to co-author publications that result primarily from the thesis research. Others who have played a significant role in the research would also be included as co-authors. An example of the ways in which co-authors can have their contributions to publication defined is "CRediT" (https://credit.niso.org/). It may be appropriate to recognize a contribution made in a limited capacity by use of an acknowledgement. A supervisor also has the right to use data for additional scientific publication beyond the initial use by the student and/or in cases where the student declines (in writing) to submit the material for publication beyond the thesis. In such situations it is normal practice for the supervisor to offer co-authorship to the student and for the student to have the right to decline co-authorship, in which case the student's contribution should be noted as an acknowledgment. Any agreements limiting the student's right to use the data, or placing time restrictions on its use, should be agreed to in writing before the research begins.

The responsibility for preparing manuscripts for submission, in thesis or other published formats, lies initially and primarily with the student. The student is expected to consult with the supervisor regarding content and format, but the ultimate responsibility for the submitted manuscript is that of the student in the case of a thesis and that of the first author in the case of scientific publications.

4. If work is to be done away from a campus facility, the feasibility of access to the research site should be clearly determined and provisions, if any, for transport and field costs discussed. The need for emergency medical transport insurance should be evaluated and secured as appropriate.

## G.4. Program and procedures common to both MSc and PhD programs

1. All students must complete BIOL 7000 as part of their program. The exception is a PhD student that had previously completed this course as part of their MSc program.

2. The subject of "Research Ethics" is addressed during Biology 7000. Depending on the student's research, they may need to complete additional training as part of their program (e.g., related to biosafety or animal care).

3. The SC should be selected before the student's arrival. The supervisor and the committee need to regularly interact in order to provide guidance and critical constructive aid during a student's program and research. Changes to the SC can be made using the "Change of Program Form".

3. There is a document available to help students prepare for SC meetings. The first meeting of the SC and the student to discuss the student's program should take place early in the program, ideally in the first semester. Areas of weakness in biology, particularly as it relates to the proposed area of research as appropriate, should be determined. Changes to course requirements (additions or deletions) must be made on the same form noted above and must be approved by the Head or Head's delegate as well as SGS.

4. It is required that a SC meeting report ("Graduate Student Annual Progress and Supervisory Report Form" https://www.mun.ca/sgs/media/production/memorial/academic/school-of-graduate-studies/school-of-graduate-studies/media-library/Supervisory_Report.pdf) be filed at least annually for every student. This report should be produced at a meeting, with the student, in which the program is reviewed to determine progress, identify problems, and project dates for completion of various tasks. If required, a "meeting" can be interpreted to be an exchange of correspondence by electronic means provided that it meets the objectives of the annual review. Under these circumstances, the form should still be completed and submitted as usual.

5. Students who take graduate courses as part of their programs must obtain a grade of B or above to remain in the program. However, there are regulations by which a substitute course may be accepted or the course can be repeated. This substitution requires a recommendation from the SC and this must be supported by the Deputy Head. The recommendation must then be accepted by the Dean of SGS. Only one substitute or repeat is permitted. Failure to meet the above conditions will result in the student's program being terminated. Students do not need to obtain an A or B average in non-program courses and failure will not normally result in termination. However, students must pay per-course tuition fees, over and above graduate school tuition, for non-program courses. It should be noted that grades in all courses are used in averages. A course that is of interest, but in which the student has little experience, may reduce averages. Thus, an audit level of participation in these courses might be considered as a more appropriate option. Auditing a course will require permission of the instructor, and instructors are not required to evaluate the progress of auditing students.

6. All graduate students handling or conducting research on vertebrates or cephalopods must complete the Animal Care training. Details are at: https://www.mun.ca/research/who-we-are/animal-care-and-veterinary-resources/training-and-orientation/.

7. All graduate students whose research requires diving should consult the Environmental Health and Safety site at: https://www.mun.ca/health_safety/health-and-safety-management-system/scientific-diving/.

8. Students who expect to use radioisotopes in their research should consult the Environmental Health and Safety site at: https://www.mun.ca/health_safety/health-and-safety-management-system/laboratory-safety/radiation-safety-at-memorial/.

9. Students whose research involves the use of microorganisms, or whose research will take place where others are working with microorganisms, should consult the Environmental Health and Safety site at: https://www.mun.ca/health_safety/health-and-safety-management-system/laboratory-safety/biosafety-at-memorial/.

10. For field research, a "Field Research Safety Document" is available. It contains a form that should be used to record information that should be useful to the Department in the event of an incident occurring during field studies. Responsibility for completing the forms lies with the field leader, but graduate students should be aware of the requirement for a completed form and are responsible for providing information as it pertains to them as individuals within the team.

11. It is the responsibility of the supervisor to ensure that all permits, certificates and clearances for any research have been obtained covering all aspects and personnel involved. There might be additional safety and training programs related to the student's research program and the Environmental Health and Safety site should be consulted as necessary: https://www.mun.ca/health_safety/health-and-safety-management-system/. It is also the supervisor's responsibility to ensure safety procedures are followed in all aspects of the work. Students who fail to follow safe procedures may be deemed to be not performing satisfactorily, and a recommendation for termination of the program can be made to the Head of Biology and Dean of SGS. It is the responsibility of the supervisor to ensure proper laboratory space and facilities are available for the student to conduct the research needed to complete the program.

## G.5. General guidelines for writing a thesis

SGS has a guideline for preparation of the thesis that should be followed: https://www.mun.ca/sgs/media/production/memorial/academic/school-of-graduate-studies/school-of-graduate-studies/media-library/go/guidpolicies/Thesis_Guidelines_1-5_1.pdf. Additional resources related to the thesis are available at: https://www.mun.ca/sgs/faculty-and-staff/theses-and-reports/.

## G.6. Additional procedures specific to the MSc

### G.6.1. Nature of the program

The main purpose of an MSc in Biology is to provide the student, under supervision, with experience in coordinating a time-limited research project including a written document in a

thesis format. This degree provides the opportunity to introduce the student to research in relation to current knowledge, and to develop defined hypotheses and explore appropriate methods. Students then present their results and discuss the results in the context of other work in the field. The conclusions and suggestions for further work demonstrate the progress achieved. It is imperative that in planning this work that the project be of a type that will provide the student a reasonable opportunity to complete the degree in two years. The planned work must also account for other obligations such as course work and TA positions.

In addition to the research and thesis it is important for the student to gain additional skills in the techniques of evaluation of research, dissemination of results, and the ability to discuss scientific ideas with others. Part of this education is obtained through required courses that can include seminar-discussion format courses. However, attendance at departmental seminars, thesis seminars, discussion groups, and acting as a TA for undergraduate courses are also deemed important aspects of the Biology graduate program.

In addition to BIOL 7000, MSc students are required to complete two additional graduate level courses. These can be courses offered outside of the Biology Department, and course selections should be made in consultation with and approved by the SC.

### G.6.2. Thesis seminar

Each MSc student will present a seminar on their thesis work. Normally, this seminar should be given after completion of the first thesis draft and before submission of the thesis for examination. This seminar is generally about 30 to 40 minutes in length followed by questions from the audience. The seminar is open to all and fellow graduate students and faculty are encouraged to attend. The seminar will be chaired by the Deputy Head (or delegate). All comments arising will be considered to be of an advisory nature for the student in moving forward with their research and thesis. This seminar is in addition to the research proposal seminar that is presented as part of Biology 7000.

### G.6.3. Examination of the MSc thesis

The thesis examination is an SGS process - see: https://www.mun.ca/sgs/faculty-and-staff/theses-and-reports/.

1. A completed “Thesis Examiners Form” must be submitted to the Department by the Supervisor. The names and some additional information about one external and two internal and examiners are required. A brief reason why the person is qualified to be an examiner is to be included. To help expedite the process, supervisors should confirm with the listed examiners that they are available and willing to examine the thesis at the expected submission time and this should be indicated on the form. The Supervisor also needs to confirm there is no conflict of interest between the potential examiners and the student. Once the Academic Program Assistant confirms the examiners’ availability, the recommendations are sent to SGS, who must approve the recommendations and appoint the examiners. The Department then forwards the thesis to the examiners. **The above process should be initiated well before the anticipated thesis**

**submission date so that the thesis can be sent out promptly once approval to do so comes from SGS.**

2. The student submits an electronic copy of the thesis to the Biology Academic Program Assistant. A form signed by the SC stating that the thesis is approved for submission must accompany the thesis.

3. The thesis is sent to two examiners. One examiner is internal to the University (not limited to just the Biology graduate program) and one is external to the University. Adjunct Professors are normally considered to be internal to the University.

### G.6.4. Evaluation of Masters Theses and Reports

The thesis examination process is described in detail in the University Calendar: https://www.mun.ca/university-calendar/school-of-graduate-studies/school-of-graduate-studies/4/10/.

### G.6.5. Final submission of examined thesis and requirements for graduation

When the thesis has been passed by the examiners and corrections have been made, the student must submit an electronic copy of the final thesis. The SC must complete and submit the "Recommendation for the Award of a Graduate Degree Form" to the Academic Program Assistant and the thesis needs final approval of the Deputy Head. The electronic copy of the thesis and any associated supplementary files should be uploaded to the University Library using the e-thesis submission form on the my.mun.ca portal.

### G.6.6. Transferring from the MSc to the PhD program

**Guidelines for Biology students requesting transfer from the MSc to the PhD program**

The decision to transfer from the MSc to the PhD program should be made after consultation among the student, supervisor and SC. Typically, a transfer is appropriate when a student is showing a strong performance in the graduate program to date and there is room for growth of the scope of the proposed research to that of a PhD program. Normally a student would apply for a change of program after one year of MSc studies and before the end of the second year.

A signed letter from the student and SC should be submitted to the Deputy Head (via the Academic Program Assistant) indicating that the transfer is requested and supported by the SC with appropriate justification. The SC will then be asked to provide a new Program of Study Form for the PhD program, which will be submitted to SGS. **NOTE:** Students that transfer from the MSc to the PhD program will be charged PhD tuition fees that are retroactive to the initial semester of their MSc program. Students receiving baseline funding will be eligible to receive 5 years of total funding from the date they started the MSc program.

## G.7. Additional procedures specific to the PhD program beyond general requirements

### G.7.1. Nature of the program

The purpose of a doctoral program is to provide the student with the opportunity to gain a high degree of competence in conducting original research at an advanced level. This should result in a significant advance in knowledge in their field of study. The program of research should be aimed at completion within a four-year time span for a full-time student. A student successfully completing a PhD program should not only be a competent researcher in their field but also be a person able to communicate and evaluate technical information. These latter skills can be acquired and demonstrated by attending and participating in various seminars, discussion groups, graduate courses, scientific meetings and undergraduate laboratory teaching.

### G.7.2. Comprehensive examination

**Purpose**
The purpose of the Comprehensive Examination is to evaluate a student's breadth and depth of knowledge in subject areas defined by their selected subdiscipline(s) (see Appendix 1) within the broader context of Biology. Students must demonstrate to the satisfaction of the Examination Committee (EC) that they possess an adequate knowledge of the literature in their subdiscipline(s) and that they have the ability to pursue and complete original research at an advanced level. Thus, PhD students, upon entering their program, should prepare for their comprehensive exam by being familiar with the general concepts and techniques in their research area ("discipline" or "area of concentration", as indicated on the Program of Study), so they are prepared to discuss them in the examination.

**Timing**
PhD students will complete the comprehensive examination no later than the end of the seventh semester in the doctoral program. It can also take place earlier, e.g., in the fifth or sixth semester, as decided by the student and their supervisor. Students who are unable to take the examination by the end of the seventh semester must request an extension by submitting a letter to the Chair of the BGSC explaining the reason(s) for the required extension. An extension will only be granted if it is approved by the Dean of Graduate Studies.

The student shall be notified of the subdiscipline(s) upon which they will be examined no later than 3 months prior to the examination.

**Format**
There are two exam options available, as discussed below. The option chosen will be decided by the supervisory committee in consultation with the student.

All exams, regardless of the option chosen, have both a written and an oral component. The written component will consist of a research proposal or paper that is submitted to the EC. Only members of the EC will be able to view the written document. The oral component will be open to the public and will consist of an oral presentation followed by a question-and-answer period.

**Examination Committee**
The composition of the EC must first be approved by the BGSC. To receive approval, the student's supervisor will submit the "Recommendation for PhD Comprehensive Examination Committee" form to BGSC for review.

The EC consists of five members:

- Chair [Deputy Head (Graduate Studies) or delegate from the Department]
- Supervisor (or co-supervisors sharing the position)
- Three faculty members from inside or outside Biology, with at least one member being from outside the student's Supervisory Committee

The Chair's role is to oversee the exam. They have the option to ask questions but are not required to do so. All members of the EC are voting members. If the student has co-supervisors, there are two options: i) only one serves on the EC, or ii) both serve on the EC and they split the questioning time and vote between them.

## Option 1: Research Proposal

***Written component***
The student will prepare a written research proposal on their thesis topic in the general style of a NSERC Discovery Grant proposal. The proposal should be double-spaced, written in a 12-pt. serif font, with 0.75-inch margins on all sides, and be a maximum of 10 pages (not including figures, tables and references). Use page numbers.
The proposal should be organized using the following sections:

- Summary of the proposal (up to 250 words, written in lay terms)
- Background
- Objectives (short- and long-term)
- Methods and proposed approaches
- Preliminary results (if available)
- Future experiments and proposed timeline of research activities
- Expected significance of the research
- References - literature cited in the proposal (maximum 2 pages, not included in the 10-
- page limit)

The thesis topic should be submitted to the Biology Graduate Administrator along with the "Recommendation for PhD Comprehensive Examination Committee" form. The Graduate Administrator will communicate the approved exam topic and guidelines to the student seven weeks before the examination. The research proposal must be made available to the members of the EC at least two weeks prior to the scheduled examination. The EC then has one week to determine if the written proposal is of sufficient merit to allow the oral component of the exam to proceed.

The research proposal will be evaluated in the following areas:

- Originality and innovation
- Significance and expected contributions to the field of research
- Clarity and scope of objectives

- Clarity and appropriateness of methodology
- Feasibility

***Oral component***
At the beginning of the examination, the student will give a 25-30 minute presentation highlighting the research proposal. Following the presentation, the candidate will be questioned by each voting member of the EC (including the chair, if they wish). The questions asked will be based primarily on the written proposal and presentation, but can also involve related topics relevant to the proposal and falling within the student's subdiscipline(s). The student is expected to be able to discuss key subject areas or fields of research that are related to their own field(s) of study, by answering questions posed by the EC.

Each member of the EC is to be given approximately 15 minutes for questions in the first round, ending with the supervisor. Each committee member is to be given the opportunity for a second round of questions, not to exceed 10 minutes each. At the end of the question period the candidate and audience will leave the examination room while the examiners discuss all facets of the examination and make their decision (see Evaluation and Outcomes section and Appendix 2).

**Option 2: Review Article**

***Written component***
The EC shall select a topic within the student's previously determined subdiscipline(s). The topic will generally be broad in scope and can be related to the thesis research. The EC will submit the topic to the Biology Graduate Administrator, on the form (Recommendation for PhD Comprehensive Examination Topic). During the discussion that determines the topic for the examination, the EC should also set a date for the examination. The date should be set with consideration that the candidate must be notified in writing seven weeks before the examination date and one week should be allowed for the BGSC to evaluate the proposed topic. The Graduate Administrator will communicate the topic and guidelines to the student seven weeks before the examination.

The written paper should be prepared using a 12-pt. serif font, with 0.75-inch margins on all sides, be double-spaced and a maximum of 20 pages (not including figures, tables and references). Use page numbers. An abstract/summary of the topic (up to 250 words) should be included at the beginning of the paper and should be written in lay terms. Figures or diagrams can be included/appended. The subsequent oral presentation (see below) will be based on the contents of the review paper. The student will submit their paper to the Graduate Administrator and the EC at least two weeks before the examination. The EC then has one week to determine if the paper is of sufficient merit to allow the oral component of the exam to proceed.

***Oral component***
The student will give a 25-30 minute presentation on the assigned examination topic. As the topic is usually broad in scope, the student is expected to provide a brief introduction followed by a more in-depth review of a narrower aspect of the subject. The student must demonstrate an understanding of the development of the subject, current knowledge, and be able to present a synthesis of the subject and opportunities for future research. After the presentation, the student

will be questioned by the EC. The questions asked by the EC will be based primarily on the written paper but can also involve related topics relevant to the article and falling within the student's subdiscipline(s).

Each member of the EC is to be given approximately 15 minutes for questions in the first round, ending with the supervisor. Each committee member is to be given the opportunity for a second round of questions, not to exceed 10 minutes each. At the end of the question period the candidate and audience will leave the examination room while the examiners discuss all facets of the examination and make their decision (see Evaluation and Outcomes section and Appendix 2).

**Evaluation and Outcomes**
Each component of the examination (written paper/proposal, oral presentation, question-and-answer period) will be assessed using a pass/fail system. To pass the examination, all three components must be deemed satisfactory (pass) based on the criteria presented in Appendix 2.

The EC shall decide the results of the comprehensive examination as follows:
**Pass:** this will be awarded to students who demonstrate an acceptable knowledge of their area(s) by achieving a satisfactory (pass) in all three exam components. This outcome requires a simple majority vote (i.e., 3/5) of the EC.

**Re-examination:** this will be for students who demonstrate an understanding of their research area(s) but who lack sufficient depth and scope, as indicated by a limited number of specific deficiencies in one or two of the exam components. This decision requires a simple majority vote (ie 3/5) of the EC. Only one such re-examination is possible. If a re-examination is to be held, it must be conducted not less than one month and not more than six months after the first examination. The decision of the voting members of the EC following this re-examination can only be "pass" or "fail", decided by simple majority. Failure will lead to immediate termination of the student's program. There is no option for further re-examination.

**Fail:** this outcome is for students who are unable to demonstrate an adequate understanding of their research area(s), as indicated by significant deficiencies in one or more of the exam components. This decision requires a unanimous vote of the EC. A simple majority vote will default to the award of "re-examination". If a student fails the examination, their program is terminated.

**Appeals**
All appeals must be made in writing to the School of Graduate Studies, clearly stating the basis for the appeal, and must be directed to the Dean or the Chair of the Appeals Committee of the School of Graduate Studies in accordance with Routes of Appeal of Academic Regulations (section 4.6.4 of University regulations: https://www.mun.ca/regoff/calendar/sectionNo=GRAD-0021).

### G.7.3. Examination of a Doctoral thesis

The thesis examination is an SGS process: https://www.mun.ca/sgs/faculty-and-staff/theses-and-reports/. The defence process is outlined here: https://www.mun.ca/sgs/current-students/defence/.

1. A completed "Thesis Examiners Form" must be submitted to the Department by the Supervisor. The names and some additional information about one external and two internal and examiners are required. A brief reason why the person is qualified to be an examiner is to be included. To help expedite the process, supervisors should confirm with the listed examiners that they are available and willing to examine the thesis at the expected submission time. This should be indicated on the form. The suggested examiners should not be in conflict of interest with the student (see: https://www.mun.ca/policy/browse-or-search/browse-policies/university-policy/?policy=565), and this needs to be confirmed by the supervisor on the form. Once the Graduate Secretary confirms the examiners' availabilities, the recommendations are sent to SGS, who must approve the recommendations and appoint the examiners. The Department then forwards the thesis to the examiners. **The above process should be initiated well before the anticipated thesis submission date so that the thesis can be sent out promptly once approval to do so comes from SGS.**

2. The student submits an electronic copy of the thesis to the Biology Academic Program Assistant. A form signed by the SC stating that the thesis is approved for submission must accompany the thesis.

3. The thesis is sent to three examiners. Two examiners are internal to the University (not limited to just the Biology graduate program) and one is external to the University. Adjunct Professors are normally considered to be internal to the University.

### G.7.4. Final submission of the examined thesis and requirements for graduation

When the thesis has been passed by the examiners and corrections have been made, the student must submit an electronic copy of the final thesis. The SC must complete and submit the "Recommendation for the Award of a Graduate Degree Form" to the Academic Program Assistant and the thesis needs final approval of the Deputy Head. The electronic copy of the thesis and any associated supplementary files should be uploaded to the University Library using the e-thesis submission form on the my.mun.ca portal.

## G.8 Time limits for revisions

MSc and PhD theses requiring re-examination shall be resubmitted to SGS within 12 months of the date that the thesis and examiners' reports were returned to the candidate.

The final version of MSc and PhD theses shall be submitted to the SGS within 6 months of the date on which the thesis and examiner's reports were returned to the student's academic unit.

**Note:** As stated earlier, graduate students are required to pay fees until the thesis and other program requirements are complete. That is, until the corrected thesis is submitted to, and accepted by the School of Graduate Studies, fees must be paid on a semester basis.

### G.9 Graduate program leaves of absence and extensions

Requests for leaves of absence or program extensions are done by submitting the appropriate form to SGS via the Deputy Head. This should involve consultation by the student by the student with their SC.
SGS forms are available at: https://www.mun.ca/sgs/current-students/forms-for-current-students/.

## H. Awards available to Biology graduate students

**Note**: It is the responsibility of the supervisor and student to notify the Department that they wish to be considered for any of these awards and to ensure that all the required documents are provided in advance of the deadline. The following are only a few of the awards that may be applicable to Biology graduate students, but they are awards for which Biology graduate students have had a record of success. Further information may be obtained from the Department and/or SGS. Also, check the SGS website for listings of available awards and the appropriate deadlines: https://www.mun.ca/sgs/current-students/tuition-funding-and-employment/awards-and-scholarships/.

**Dr. F.A. Aldrich Alumni Graduate Scholarship**. Three of these $2000 scholarships are awarded annually based on academic merit and need. Nominations will be made to the Dean of Science in May of each year. It is therefore advisable that if a graduate student wishes to be considered for this award, all pertinent information be submitted to the Biology Academic Program Assistant before mid-April.

**The A.G. Hatcher Memorial Scholarship**. Three or more scholarships are awarded annually based on academic merit. Nominations are made to the Dean's Advisory Committee on Scholarships and Awards by early August and all required information should be received by the Biology Academic Program Assistant no later than mid-July. The value of the Scholarship is $15,000 and it can be held for one year only.

**School of Graduate Studies F.A. Aldrich Fellowships**. This is a university-wide competition open to all incoming full-time students. The SGS deadline for application is about the 3rd week of February and applications should be submitted to the Biology Department by the end of the 1st week of February. These are valued at $20,000 and $15,000, per year, for PhD and MSc applicants respectively. Subject to certain restrictions, these are renewable for up to one year for PhD students. Approximately six to eight fellowships are awarded each year. These are awarded for exceptional academic achievement.

**The Maritime Awards Society of Canada (MASC) Maritime Studies Scholarship**. This can be awarded to a Canadian citizen studying in a "maritime based" program at either the MSc or PhD level. It has a value of $5,000.00 per year and may be renewed once. Information about this opportunity can be found at: Scholarships | Maritime Awards Society of Canada

**The National Scholarship in Ocean Studies at Memorial University of Newfoundland**. This can be awarded to PhD candidates in an aspect of ocean studies. The value is $18,000 per year for up to three years. The award is based on academic excellence. Guidelines and applications are available from the School of Graduate Studies.

**The Leslie Tuck-Avian Ecology Award**. This award is for $1,000 annually and is awarded based on a 500-word essay on the student's research and its relevance to avian ecology and ecosystem preservation in Newfoundland and Labrador. Information about this opportunity can be found at: Awards – Nature NL

**The George Weston Graduate Scholarships**. Two awards at a minimum of $2,000 may be made annually to full time graduate students. One of these is given in the field of Marine Biology. Applicants must have been born in one of the Atlantic Provinces.

**Royal Bank Fellowship in Marine Studies**. This award is valued at $5,000 and re-applications will be considered. The award is based on academic merit and is open to full-time graduate students in marine studies.

**Fellow of the School of Graduate Studies.** The title of Fellow of the School of Graduate Studies is awarded in recognition of outstanding academic achievement and demonstrated performance of special merit throughout a graduate program. It may be awarded only once, during the last year of a student's graduate degree program. This distinction will be noted on the student's Memorial University transcript. Nominations must be submitted to the Dean of SGS by the Deputy Head at least one month prior to Convocation, (i.e., April and September). Information about this distinction can be found at: https://www.mun.ca/sgs/current-students/tuition-funding-and-employment/fellow-of-the-school-of-graduate-studies/.

**Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarships and Fellowships**. The annual competition for these awards commences in the Fall semester of each year. Opportunities can be found at: NSERC – Postgraduate programs (nserc-crsng.gc.ca)

# APPENDIX 1: Forms and additional documents for supervisors and students

**Biology forms and documents:**

New Student Request Form
Field Research Safety Document
Guidelines for Preparing for a Supervisory Committee Meeting
Thesis Examiners Form
Comprehensive Exam Committee Form
Comprehensive Exam Topic Form
BGSC Terms of Reference

**SGS forms:**

Program of Study Form
Supervisory Committee Meeting Report Form
Thesis Submission Form
Recommendation for the Award of a Graduate Degree Form

# APPENDIX 2: Subdisciplines for Biology Comprehensive Examinations

(based on NSERC research topics; source: https://www.nserc-crsng.gc.ca/professors-professeurs/grants-subs/dgplist-psdliste_eng.asp#1501)

**Supervisors: Select 1-2 of the following subdisciplines and enter these on the "Recommendation for PhD Comprehensive Examination Committee" form.**

Subdisciplines within the area of concentration **"Microbiology"**

- Bacteriology
- Virology
- Protozoology
- Mycology
- Bioremediation
- Environmental microbiology
- Microbial pathogenesis
- Microbial epidemiology
- Symbiosis and beneficial interactions
- Microbial ecology
- Microbial genomics
- Microbial physiology
- Parasitology
- Microbiome
- Microbial communities

Subdisciplines within the area of concentration **"Biochemistry"**

- Metabolic pathways
- Protein structure and function
- Metabolomics
- Enzymology
- Protein-protein interactions
- Proteomics
- Lipidomics
- Biochemical techniques
- Biophysics
- Glycobiology

Subdisciplines within the area of concentration **"Plant Biology"**

- Plant pathology
- Stress physiology
- Plant nutrition and metabolism; photosynthesis
- Plant growth and development
- Plant reproduction
- Silviculture
- Water and minerals in plants
- Crop and pasture production, breeding
- Plant morphology
- Plant secondary metabolism
- Hormone biology
- Plant growth regulation (metabolism and biosynthesis)

Subdisciplines within the area of concentration **"Animal Physiology"**

- Neurophysiology
- Endocrinology
- Animal reproduction and breeding
- Animal morphology
- Animal nutrition and husbandry
- Veterinary sciences
- Behavioural neuroscience
- Systems physiology (cardiovascular, respiration, urinary...)
- Animal feeding, nutrition (nutrigenomics) and metabolism
- Animal disease, pathogens and pathology
- Animal toxicology/ecotoxicology
- Quantitative physiology, mathematical modelling
- Biophysics
- Sensory and motor systems
- Muscle and movement physiology/biomechanics
- Ecophysiology/environmental physiology/environmental stress

Subdisciplines within the area of concentration **"Molecular Genetics"**

- Gene regulation and expression
- Gene and chromosome structure
- Signal transduction for gene expression
- Transcription factors
- Quantitative genetics/genomics
- Epigenetics
- Genome sequencing and analysis
- Genome editing, transgenic organisms
- Transcriptomics/RNA expression, RNA sequencing
- Post-transcriptional regulation
- Proteomics

Subdisciplines within the area of concentration **"Evolutionary and Developmental Genetics"**

- Population genetics
- Comparative genetics
- Gene transfer
- Developmental epigenetics
- Cell differentiation
- Phylogenetics

Subdisciplines within the area of concentration **"Ecological and Evolutionary Applications"**

- Climate change
- Conservation biology
- Conservation genetics
- Ecotoxicology
- Endangered species
- Fisheries, wildlife and forestry
- Management
- Habitat loss
- Harvesting

- Invasive species
- Resource selection
- Sylvics
- Population viability
- Species recovery

Subdisciplines within the area of concentration **"Quantitative Approaches"**

- Bioinformatics
- Biomathematics
- Biostatistics
- Computational neuroscience
- Statistical genomics and genomic analysis
- Multiscale modelling
- Computer simulation of protein, nucleic acid and membrane structure/dynamics

Subdisciplines within the area of concentration **"Ecology and Evolution of Behaviour"**

- Behavioural syndromes
- Cooperation and conflict
- Foraging
- Habitat selection
- Information gathering
- Kin selection
- Mate choice
- Mating systems
- Patch uses
- Sexual conflict
- Social organization

Subdisciplines within the area of concentration **"Ecosystem Patterns and Processes"**

- Decomposition
- Diversity and stability
- Ecological engineering
- Energy flow
- Food webs
- Isotope signatures
- Nutrient cycling
- Physical and chemical dynamics
- Size spectra

Subdisciplines within the area of concentration "**Spatial Patterns in Ecology and Evolution"**

- Biogeography
- Dispersal
- Distribution
- Geographical information systems (GIS)
- Geographical ranges
- Habitat fragmentation
- Island biogeography
- Landscapes
- Migration

Subdisciplines within the area of concentration **"Ecological Function"**

- Constraints and trade offs
- Development
- Ecological stoichiometry
- Ecophysiology
- Life cycles
- Performance indicators

Subdisciplines within the area of concentration **"Populations and Communities"**

- Community assembly
- Community structure
- Competition
- Demography
- Indirect effects
- Metapopulations
- Multi-kingdom interactions
- Population dynamics
- Predator-prey dynamics
- Species interactions

Subdisciplines within the area of concentration **"Evolutionary Processes"**

- Adaptation
- Character displacement
- Co-evolution
- Density and frequency dependence
- Evlutionary genetics
- Life history
- Phenotypic plasticity
- Sexual selection
- Speciation

Subdisciplines within the area of concentration **"Mathematics and Statistical Models in Evolution and Ecology"**

- Bioinformatics
- Capture, mark, recapture theory
- Ecological and evolutionary models
- Evolutionary games
- Model selection
- Resource models
- Statistical theory
- Stochastic processes

# APPENDIX 3: Evaluation Criteria for Comprehensive Exam

**(1) Written Paper/Proposal**

- **Abstract/Summary:** summarizes the main components of the paper/proposal; written in lay terms (up to 250 words maximum)
- **Introduction/Background:** Strong introduction of topic's key question(s); background information explains topic's scope and importance; key concepts and theories are well explained
- **Body:**
  - Paper: Research results and trends are accurately reported; research results and trends are well interpreted; areas of controversy are identified and discussed; open questions and future directions are identified
  - Proposal: Short and long-term objectives are clearly defined; methodology is clear, appropriate and feasible; proposed work is original and innovative; significance and expected contributions to the field of research are discussed
- **Figures and Tables:** are well designed and complement the text
- **Grammar and Mechanics:** paper/proposal is logically organized and generally free of grammatical, spelling and punctuation errors; page limits and formatting guidelines are followed:
  - Proposal: double-spaced, 12 pt serif font, 0.75-inch margins on all sides, maximum of 10 pages (not including figures, tables and references)
  - Paper: double-spaced, 12 pt serif font, 0.75-inch margins on all sides, maximum of 20 pages (not including figures, tables and references)
- **Citations:** key publications are cited and include recent publications from the literature; citations and literature cited match and are formatted uniformly

**(2) Oral Presentation**

- **Content:** Presentation demonstrates a thorough understanding of the topic; the information presented is accurate and complements the written paper/proposal
- **Organization, Delivery and Style:** Presentation is clear, logical and well organized; presentation is well paced with a good flow; student speaks to the audience and not the screen, and does not rely on notes; student uses grammatically correct sentences and appropriate vocabulary; the speech is fluid with appropriate inflection, and is loud and clear enough to be heard by the audience; the body language is relaxed and self-confident
- **Design:** Presentation slides are visually well designed and aesthetically pleasing; text is visible and minimal on each slide, and is generally free from errors (spelling, punctuation, grammar, formatting, etc.); visuals used are effective in enhancing the presentation

**(3) Questions and Answers**

- **Content:** Student understands the theories/concepts important to the examination topic; student understands the questions and their contexts; student acknowledges limitations of knowledge
- **Organization, Delivery and Style**: Student answers the questions clearly, fully, and concisely; students ask questions and engages in discussion with the examiners; the student's body language and speech are effective and comfortable, and they make eye contact with the examiner