

Department of Chemistry
Brock University

Graduate Program Handbook

(Revised September 2020 by M. Pilkington)

<http://www.brocku.ca/chemistry/graduate/gradstudies.html>

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1. General Information

Graduate Studies at Brock University

General information focused on graduate studies at Brock University can be found by consulting the Faculty of Graduate Studies website at: www.brocku.ca/gradstudies/

Brock University is committed to building and maintaining a diverse and inclusive community where our students, staff, faculty, course participants, volunteers and visitors can work and learn in an environment that respects the dignity and worth of members of the Brock community. For more information consult the following link:

<https://brocku.ca/policies/wp-content/uploads/sites/94/Respectful-Work-and-Learning-Environment-Policy.pdf>

Graduate Student Support at Brock University

The Graduate Student Support Coordinator (**Andie Nero**, MC D529;

Email: gradsupport@brocku.ca). She can connect you with a number of support services and resources to help in all aspects of graduate student life. For more information concerning the ways she can help see the following link: <https://brocku.ca/graduate-studies/student-resources/graduate-student-support/>

Graduate Studies in the Department of Chemistry

The Department provides facilities for students intending to work toward their Master's and/or Doctoral degrees in Chemistry. In addition to their research supervisor and supervisory committee, graduate students are encouraged to contact the graduate program director (GPD) (Dr. **Melanie Pilkington**, CRN 410; **Email: mpilkington@brocku.ca**) for any concerns or questions they may have relating to their progress through their chemistry program. Students can also contact the Graduate Administrator Coordinator for Maths and Science, (**Elena Genkin**, MC D473; Email: **egenkin@brocku.ca**) for access to forms and information relating to their courses and procedures for candidacy exams and thesis defences.

Faculty members specialize in Organic/Bio-organic Chemistry, Inorganic Chemistry, Molecular Magnetism, Physical/Theoretical Chemistry, and Analytical Chemistry. Specific faculty research interests can be found at the Department's website

www.brocku.ca/chemistry/research/interests.html: .

Research Active Staff and Faculty in the Department of Chemistry

Jeffrey K. Atkinson, Professor (PhD, *Ottawa*), Organic Chemistry www.brocku.ca/chemistry/faculty/Atkinson/

Travis Dudding, Professor (PhD, *John Hopkins*), Organic Chemistry www.brocku.ca/chemistry/faculty/Dudding/

Feng Li, Associate Professor (PhD, *Alberta*), Analytical Chemistry

www.brocku.ca/mathematics-science/chemistry/feng-li/

Tomas Hudlicky, Professor (PhD, *Rice*), Organic Chemistry

www.brocku.ca/chemistry/faculty/Hudlicky/

Martin T. Lemaire, Associate Professor (PhD, *Victoria*), Inorganic Chemistry

www.brocku.ca/chemistry/faculty/Lemaire/

Costa Metallinos, Professor (PhD, *Queen's*), Organic Chemistry

www.brocku.ca/chemistry/faculty/Metallinos/

Georgii I. Nikonov, Professor (PhD, *Moscow*), Inorganic Chemistry

www.brocku.ca/chemistry/faculty/Nikonov/

Melanie Pilkington, Professor (PhD, *Kent*), Inorganic Chemistry

www.brocku.ca/chemistry/faculty/Pilkington/

Arthur van der Est, Professor (PhD, *British Columbia*), Physical and Theoretical Chemistry

www.brocku.ca/chemistry/faculty/van_der_Est/

Hongbin (Tony) Yan, Professor (PhD, *London*), Organic Chemistry

www.brocku.ca/chemistry/faculty/Yan/

Paul Zelisko, Instructor, (PhD, *McMaster*), Organic Chemistry

<https://brocku.ca/mathematics-science/chemistry/paul-zelisko/>

2. Registration Procedures

General graduate student registration procedures are outlined within the Brock University Registration guide, which is available at the following website:

www.brocku.ca/registrar/guides/grad/procedures.php.

Note: For new students, all pre-registration conditions outlined in your offer of admission letter must be met before registering for graduate courses.

Students must register and pay tuition for every semester in which they are registered as a graduate student.

All chemistry graduate students must complete the Chemistry Graduate Pre-Registration Approval Form (www.brocku.ca/chemistry/graduate/gradreg.doc) and submit the completed and signed form to the Graduate Program Director. When the course(s) have been approved proceed to register on-line. If a graduate student is interested in registering for a course not listed on the timetable, please contact the Graduate Program Director.

When on-line registration closes, all further registration, or changes to registration, must be completed manually via the Course Registration/Withdrawal Form, available from the Faculty of Graduate Studies or directly downloaded from:

www.brocku.ca/gradstudies/forms/CourseRegistrationWithdrawalForm-03-08.pdf and submitted to the Faculty of Graduate Studies.

Requests for inactive terms or leave of absence can be made by first completing the

appropriate forms available from the Faculty of Graduate Studies or can be downloaded from the website: www.brocku.ca/gradstudies/current/forms.php

3. Financial support

Full time students (MSc and PhD) will normally be supported by a Research Assistantship paid from the research operating grants of supervising faculty (up to \$10,000/year), a Graduate Fellowship from the University (typically \$7,500/year for MSc and \$15,500/year for PhD students), and Teaching Assistantships in the undergraduate laboratory program in the Brock Department of Chemistry (\$4,038/term, typically awarded for 2 terms).

In addition, international students may receive bursaries to help offset the cost of higher tuition fees. Students in financial need may qualify for additional bursaries. Please visit the Faculty of Graduate Studies Financial Information website for more information at:

www.brocku.ca/gradstudies/current/financial.php.

Note: The value of Graduate Fellowships awarded by the Office of Graduate Studies to full-time students in research-based programs differs between MSc and PhD programs and is dependent on whether or not students receive external awards (e.g. NSERC or OGS). Students should make sure that they understand for how many terms they will be supported by each component of their funding package. Brock currently offers full-time research-based graduate students a funding package for the defined length of the graduate program (6 terms for the MSc Chemistry program, 12 terms for the PhD Chemistry program) see:

<https://brocku.ca/graduate-studies/scholarships-awards/>

Additional information breaking down the main sources of graduate support can be found on the graduate studies website at:

<https://brocku.ca/graduate-studies/financial-resources/funding/>

Graduate students may also apply for Internal Donor Awards, Travel Expense Reimbursement and Bursaries, throughout their studies. External scholarships and awards are also available to those who qualify. Information is given at: <https://brocku.ca/graduate-studies/scholarships-awards/external/>

Canadian students with excellent undergraduate marks (generally “A” level in the last two years of study) may qualify for provincial (OGS or OGSST) or federal (NSERC) graduate scholarships. See the link: <https://brocku.ca/graduate-studies/scholarships-awards/external/>

Current tuition and related fees for graduate students may be found at the following link: <https://brocku.ca/safa/graduate-tuition-and-fees-2019-fw/>

4. Program Requirements - MSc

Admission requirements

Successful completion of an Honours Bachelor's degree, or equivalent, in Chemistry or a cognate discipline such as Biochemistry or Biotechnology normally with an overall average of not less than 78%. We recommend that international students provide results from a completed Graduate Record Examination (GRE). Agreement from a faculty supervisor to supervise the student is required for admission to the program. Those lacking sufficient background preparation may be required to complete a qualifying term/year to upgrade their applications. Completion of a qualifying term/year does not guarantee acceptance into the program.

Students may be admitted as full-time or part-time. Full-time programs should normally be completed in six-terms or 2 years. Students interested in part-time study at the MSc level should consult the Graduate Program Director (GPD). Please note that a change to part-time status affects a graduate student's funding (i.e. no Graduate Fellowships are provided to part-time students) and preference in hiring for teaching assistantship positions.

Required courses

Students must enrol in CHEM 5F90 each term, as well as participate in the seminar course CHEM 5P95, in which each student will present one seminar on a topic approved by the candidate's Supervisor. ***The student's seminar must be presented within the first academic year of study.*** Students are expected to attend all seminars presented in the Department. As part of CHEM 5F90, every MSc candidate must prepare and defend a thesis that demonstrates a capacity for independent work of acceptable scientific caliber. There will be an oral defence of the written thesis.

In addition to 5F90 and 5P95, students must complete a minimum of one and one-half credits of course work, which must include two 5(alpha)00 level half credits; one half-credit (or one credit), which may be at either the 4(alpha)00 or 5(alpha)00 level. Note that graduate credit is not given in courses where the final grade is less than 70%. Students are expected to achieve a minimum grade of 70% in all graduate courses. **Obtaining a failing grade (< 70%) in a graduate course is sufficient grounds for dismissal from the program.**

Additional credits may be required of candidates with insufficient preparation in the area of research specialization. When appropriate and with prior permission of the supervisory committee, courses offered outside the Department of Chemistry may be taken to fulfill course requirements.

Depending on their background, candidates may be required to take extra courses from either the graduate or undergraduate calendar in addition to those noted above. For descriptions of our current graduate courses see:

<https://brocku.ca/webcal/current/graduate/CHEM.html>

Courses are chosen in consultation with the Supervisory Committee, and prior to formal web registration, all graduate students must complete the Graduate Registration Pre-approval Form, which can be obtained from the Chemistry Department's website at:

www.brocku.ca/chemistry/graduate/gradreg.pdf

Descriptions of all graduate courses offered by the Chemistry Department may be found within the Chemistry Graduate Calendar (www.brocku.ca/webcal/current/graduate/CHEM.html).

5. Program Requirements - PhD

Admission requirements and MSc to PhD transfer

For admission into the PhD program, successful completion of an MSc degree, or equivalent in Chemistry or closely allied discipline, e.g. Biochemistry, with an overall average of not less than 80% is required. Students may also be permitted to enter the PhD program after successfully completing a minimum of one year in the Brock Chemistry MSc program.

Approval to transfer to the PhD program may be given by the Chair after having received a favourable written report from the student's Supervisory Committee. Typically, the acceptable candidate would have achieved the following: Successful completion of at least one full credit towards the degree with an average above 75%; presentation of one 50 min seminar as part of the seminar course CHEM 5P95. Some accommodation may be given in particular instances.

A minimum of three years (36 months) of resident, full-time study is required. Students registered as full-time will be expected to complete all degree requirements within four years following entry into the PhD program. It is not possible to complete a PhD degree entirely on a part-time basis. After completion of the full-time residency requirement (three years) a student may request part-time status provided that a draft of the thesis has been submitted, but before submission of the final copy and scheduling of the defence has begun.

Required courses

Students must enroll in CHEM 7F90 each term. In addition, coursework is required as described in the subsequent sections. ***Note that graduate credit is not given in courses where the final grade is less than 70%.*** As part of CHEM 7F90 all students must complete a research project that culminates in a thesis that demonstrates independent thought and work, and which represents an original contribution to scientific knowledge. There will be an oral defense of the written thesis.

(a) Students proceeding from an Honours BSc or equivalent, and who have transferred from the MSc to the PhD program, must complete a total of 4.5 credits (9 half-credits). These credits must include:

1. CHEM 7F90; CHEM 5P95 and 7P95
2. CHEM 5N01 (a non-credit scientific writing course)

3. Four 5(alpha)00 level half-credits^{1,2,3}

4. One additional half-credit that may be either at the 4(alpha)00 or 5(alpha)00 level

Students in the Organic Field must take any two of [CHEM 5P21](#), [5P19](#), and [5P40](#) but it is recommended that they take all three. Additional course(s) are taken to comply with the requirement, as outlined above, of a total of three 5(alpha)00 level half-credits, and one additional half-credit that may be either at the 4(alpha)00 or 5(alpha)00 level.

Students in the Physical and Computational Field should take [CHEM 5P67](#), and three other half-credit courses approved by their supervisory committee, in order to comply with the requirement, as outlined above, of a total of three 5(alpha)00 level half-credits, and one additional half-credit that may be either at the 4(alpha)00 or 5(alpha)00 level.

Students in the Inorganic Field must take three courses from CHEM [4P30](#), [5P31](#), [5P32](#), [5P33](#), [5P34](#), [5P40](#), [5P44](#) and [5P67](#) and one half-credit course approved by their supervisory committee in order to comply with the requirement, as outlined above, of a total of three 5(alpha)00 level half-credits, and one additional half-credit that may be either at the 4(alpha)00 level or 5(alpha)00 level.

⁴ **Students in the Analytical Field** must take two courses from [CHEM 5P38](#), [5P41](#), and [5P44](#) and two additional half-credit courses, one of which may be at either the 4(alpha)00 or 5(alpha)00 level, as approved by their supervisory committee.

Note: In any of the fields, one half-credit may be taken from other 5(alpha)00 level courses offered in the graduate programs of Biological Sciences, Biotechnology, Computer Science, Mathematics, or Physics with the permission of the student's Supervisory Committee.

(b) For students entering the PhD program after completion of an MSc or equivalent, the PhD program must include:

1. CHEM 7F90; CHEM 5P95 and 7P95

2. CHEM 5N01

3. Three 5(alpha)00 level half-credits (at least). The choice of these and additional credits, required for candidates with insufficient preparation in their areas of research specialization, are at the discretion of the students Supervisory Committee.

Note that failing grades (<70%) in graduate courses are sufficient grounds for dismissal from the program.

6. Composition of Thesis Supervisory Committees

All students are supervised by a thesis committee. Thesis committees typically consist of the

student's research supervisor and two additional faculty members from the Department of Chemistry, one of whom will serve as Chair of the Committee. Exceptions to this structure may occur when the supervisor's appointment is cross-appointed with another Department, such as Physics.

Wherever possible, thesis committees will be chosen by the Graduate Program Director according to the following criteria. Supervisors are welcome to suggest appropriate faculty for their students' committees:

1. There are 4 major research areas in the Department. At least one committee member will be from the same research area as the student and supervisor.
2. Three committee members (including the supervisor) will be from Chemistry or cross-appointed to Chemistry from another Brock University Department.
3. Adjunct faculty or instructors in Chemistry may co-supervise MSc students with faculty from Chemistry. Adjunct faculty may sit as additional committee members on thesis committees, consistent with item 2.
4. Cross-appointed faculty in Chemistry may supervise MSc and PhD students. Cross-appointed faculty may sit as additional committee members on thesis committees, consistent with item 2.
5. The Graduate Program Director will attempt to distribute thesis committee duties equitably among faculty.

In the absence of the supervisor (e.g., during sabbatical), the Graduate Program Director, in consultation with the Supervisory Committee, shall ensure that a resident faculty member is responsible for overseeing the student. In the event that the supervisor leaves the University permanently, the Graduate Program Director, in consultation with the Supervisory Committee, shall appoint a new supervisor.

7. Monitoring of Graduate Student Progress

Graduate students are responsible for convening their committees for regular committee meetings. Thesis committees must meet once every six months over the duration of the student's program. A committee meeting should also be held when major changes to a student's program are contemplated, such as transfer from the MSc to the PhD program or a major change to the student's proposed research project. Graduate student committee meetings must be documented with the Graduate Student Progress Report that is available from the Chemistry Department's website (www.brocku.ca/chemistry/graduate/progressreport.pdf). Graduate student progress is monitored by the Chemistry Graduate Committee. Students should be aware that it is their responsibility to make sure committee meetings take place.

Note: When a graduate student's progress has been deemed unsatisfactory, the committee will meet again within six months to evaluate the student's progress. Students may be

dismissed from the graduate program after two successive committee meetings in which their Research Progress is deemed to have been unsatisfactory.

8. Conflict Resolution for Graduate Students

If a graduate student encounters a conflict that s/he is unable to resolve with their supervisor, the graduate student should then inform the Graduate Program Director of the problem and the Graduate Program Director will try to facilitate a satisfactory resolution to the conflict. If the student's supervisor is the Graduate Program Director, the conflict should be directed to a member of the Departmental Graduate Committee where the Graduate Committee will try to facilitate a satisfactory resolution to the conflict. If a satisfactory resolution to the conflict is not reached, the Departmental Graduate Committee will then make a recommendation to the Dean of Mathematics and Science for resolving the problem. Seeking guidance from the Dean of Graduate Studies in resolving conflicts is an additional avenue open to the GPD and the Graduate Committee.

9. Academic Integrity

The department of chemistry supports graduate students in their pursuit of a higher standard of scholarship, teaching and research. Academic integrity means upholding a strong personal and professional ethic within our own work, and that of our colleagues. In upholding the principles of academic integrity graduate students are expected to demonstrate respect and acknowledgement of others' words and ideas when conducting research, writing, publishing, and teaching.

Plagiarism is submitting material, in whole or in part that is not your own work without citing the source. This is taken very seriously, and graduate students must take care to appropriately reference source material, including figures and schemes that are included within the body of all written pieces of their scientific work. Although paraphrasing is not strictly considered to be plagiarism, students must make sure the source of the original idea is correctly cited. All basic concepts and ideas presented within a thesis should be written in the students' own words. Additional information for graduate students related to studying with integrity can be found at this link: <https://brocku.ca/academic-integrity/graduate-studying-with-integrity/>

10. PhD Candidacy Exam Regulations

Introduction

The candidacy exam is designed to provide standardized criteria for the assessment of PhD candidates and is a requirement for successful completion of the PhD program. The exam combines a written component with an oral presentation and defence. The written component is a research proposal on a topic not directly related to the candidate's or the supervisor's research prepared in the general format of an *NSERC Discovery Grant* proposal. This format will encourage students to read rigorously the scientific literature, to identify and elaborate on

current research directions, and to prepare and defend a document describing a reasonable research goal. Please note that NSERC supports research programs and not individual projects so the research proposal should typically comprise of 2-3 research projects suitable for the training of the proposed HQP (highly qualified personnel).

Although it is a requirement that students work on their candidacy proposal independently of their supervisor's input, they are encouraged to seek guidance from their supervisory committee and/or the GPD when needed.

Timing of Exam

Students entering the PhD program with an MSc Degree

Students who enter the PhD program with an MSc must pass the candidacy exam before the end of the student's third year in the program.

Students transferring to the PhD program from the MSc Program

After transfer to the PhD program, candidates must complete the PhD candidacy exam by the end of the third year of their enrolment in the PhD program. All candidates must notify the Department Chair and Departmental Graduate Officer at least 8 weeks prior to the end of their third year of registration in the PhD program of their intent to write the candidacy exam.

Failure to meet the deadlines

Students who fail to meet the above deadlines will be considered to have failed the candidacy exam. In exceptional circumstances such students may appeal the failing grade using the procedures outlined at the end of this document.

Examination Procedures

Composition of the Examination Committee

The Examination Committee will be composed of the following members:

1. The Chair of the examination committee who will be appointed by the Chemistry Department Chair in consultation with the Departmental Graduate Officer. The Chair of the examination committee does not vote.
2. The student's Supervisory Committee - normally composed of the student's direct supervisor plus two members of the Department of Chemistry, one of whom is in the

same field of research as the student's direct supervisor.

3. One other faculty member suggested by the student's supervisory committee who may be from the Department of Chemistry or any other department within the Faculty of Mathematics and Sciences.
4. Each examiner will evaluate the written proposal, complete the evaluation form (www.brocku.ca/chemistry/graduate/Candidacy%20Examination/Evaluation_form_proposal.pdf) and deliver it to the Chemistry Department Administrative Assistant no later than 48 hours prior to the examination.
5. If the proposal is deemed to be acceptable, the examination will proceed as scheduled. If the examining committee finds the proposal to be unacceptable, the examination will be postponed and the student will be asked to re-write it within a stated time limit that is at the discretion of the examining committee.
6. During the examination, the student's direct supervisor is permitted to ask questions but will not vote. The supervisor will be allowed to address the examination committee prior to the vote on the student's performance. No member of the supervisory committee who has been named as a co-supervisor will be allowed to examine the candidate.

Format of the Written Research Proposal

The exam will test the candidate's ability to put forward a research plan, defend its rationale and anticipate its outcomes. It provides a forum to view the candidate's ability to describe a research goal based on literature precedent, to defend that goal and the methods by which the goal will be achieved. As such, the exam should also serve as a barometer of the candidate's capacity for independent thought. The proposal should be realistic, such that a single research supervisor and his/her students could make significant progress on the topic given five years effort.

The proposal will have the general format of an NSERC Discovery Grant proposal and will include:

1. A plain language summary of 250 words or less.
2. A budget and justification for personnel, equipment, materials, and any other necessary costs.
3. An introduction and background information that situates the topic in the literature.
4. A proposal describing new work. This should include the objectives of the research program. The essential design of any experiments to be performed and a description

of the experimental and/or theoretical methods that will be used to achieve the objectives.

Please use the forms and guidelines located on the Brock Chemistry website to prepare your proposal. Pay strict attention to the requirements regarding number of pages, font size, page margins, etc.

1. NSERC style application form
(www.brocku.ca/chemistry/graduate/Candidacy%20Examination/Proposal%20budget%20form.pdf)
2. Guidelines for preparing the proposal (See Appendix B)

Students should be prepared to supply an electronic copy of the proposal upon request. Normally, a proposal would include no more than two or three figures or tables. Figures should clarify, and not serve as a replacement for additional text. A copy for each member of the committee should be submitted to the Administrative Assistant for the Department of Chemistry two weeks prior to the examination.

Choice of Topic

Understanding that the choice of suitable topic places an inordinate amount of responsibility on the candidate, the topic of the research proposal may be arrived at as follows: Once the candidate has announced his/her intention to take the examination, the supervisory committee will solicit topics from the candidate and vet them, rejecting grandiose or trivial topics, as well as those deemed too similar to the candidate's thesis research. On behalf of the supervisory committee, the student's immediate supervisor will notify the Departmental Chair and the Graduate Officer once a suitable topic has been chosen. No student should proceed with preparation of a research proposal without having received permission to do so from the Examination Committee.

Format of the Oral Presentation

The candidate will give a brief oral presentation of the research plan, its rationale and expected outcomes. This presentation may be no longer than 25 minutes. Candidates are advised not to spend too much time reviewing background material discussed in their written proposal. Presentations longer than 25 minutes will be stopped by the Chair of the Examination Committee.

Format of the Questioning

There will be two rounds of questions by the examiners. The Chair may also participate in the

questions but is not required to do so. Questions must relate to the proposal, but can cover any aspect of the proposal and the background to it. They are expected to be wide-ranging, but if questions stray too far from the topic or serve no obvious assessment purpose, then the opinion of the Chair will determine whether the discussion shall continue.

Assessment Procedures

The examination is to assess whether the candidate has the ability to synthesize a coherent, potentially achievable research proposal, and to defend that topic and the chosen methods. The candidate's performance will be based on the following criteria:

1. The understanding of basic principles, including (but not limited to) principles behind the methodology and the background to the phenomenon or topic being investigated.
2. The feasibility of the project and the approach chosen by the candidate.
3. The clarity of communication, both in the written research proposal and during the oral presentation and questioning.
4. The adequacy of the introduction and the literature review.

Method of Assessment

The candidate will be asked to leave immediately following the questioning and wait at some location removed from the examination room. The supervisor(s) will be invited to make comments on the candidate's performance and on the appropriateness of the direction of questioning. The supervisor(s) will be asked to leave prior to the discussion of the candidate's performance. The Examination Committee will discuss the candidate's performance taking into consideration the supervisor's comments. The members of the committee will vote and the results of the vote will indicate in the first instance whether the candidate will be allowed to proceed in the PhD program. If the vote does not favour continuance in the PhD program, the committee will recommend whether the student will be invited to write an MSc thesis or will be asked to leave the program.

The vote will be confidential.

The Examination Committee may request that a passing performance for the candidate be recorded only after completion of remedial work, which may include tests, essays or courses, and is at the discretion of the Examining Committee.

The evaluation of the committee will be recorded on the Candidacy Examination Evaluation Form (www.brocku.ca/chemistry/graduate/Candidacy%20Examination/Evaluation_form_examination.pdf) and placed in the student's file.

Role of the Chair

The Chair of the Examination Committee has the following responsibilities:

1. To note the areas where the candidate excels or has difficulty, and the supervisor's comments.
2. To ensure that the questioning remains on time and on track.
3. To count the vote of the final assessment.
4. To note the final results.
5. To communicate the final result (pass or fail, and whether any remedial work is required) to the student, the supervisor, the Departmental Graduate Officer and the Chair of the Department of Chemistry.

Appeals Procedure

1. To appeal the result of a Candidacy Examination, the candidate must provide a written request to Chair (or Acting Chair) of the Department of Chemistry stating the basis for the action within one week following the exam. Only in exceptional circumstances will an appeal based on arguments of scientific merit be considered. It is not the purpose of the appeals committee to re- do the exam. Should the Department Chair be the student's immediate supervisor, the Graduate Officer will accept and process the written appeal.
2. The Chair (or Graduate Officer) will then form a three-member Appeals Committee to consider the request. The Graduate Officer will Chair the Appeals Committee. If the Graduate Officer is the supervisor of the student requesting an appeal, the Chair of the Appeals Committee will be the Chair (or Acting Chair) of the Department of Chemistry. The two remaining members will be chosen from those among the Department of Chemistry who have no direct involvement with the student or other conflict of interest. If it is impossible to find three such individuals, other faculty, from outside the department may be asked to serve.
3. The Graduate Officer, in cooperation with the Examination Committee, will prepare a written report regarding the outcome of the candidacy examination. The candidate's supervisor may also elect to submit a letter to the committee. Any other relevant

documentation, from any party, must be submitted to the Graduate Officer as Chair of the Appeals Committee. At its discretion, the Appeals Committee may also interview the participants; first the examining committee, then the student and supervisor.

4. The appeals committee will meet within one week to arrive at a judgment. A brief report must be written dealing with the acceptability of the grounds for the appeal and whether the appeal is denied or approved. The report is presented to the Chair of the Department.
5. A successful appeal will result in a repeat of the Candidacy exam with the same examination committee (if possible) unless specific circumstances dictate otherwise. The appeal committee report will be provided to all members of the examining committee, the appeals committee, the appellant and the Chair of the Department of Chemistry.
6. Further appeals must be directed to the Dean of Graduate Studies.

11. Thesis Regulations

Graduate thesis regulations are outlined in the Academic Regulations section of the Graduate Calendar (www.brocku.ca/webcal/current/graduate/acad.html#sec56) and in Section 14.7 of the Faculty Handbook (www.brocku.ca/secretariat/facultyhandbook/). Students and supervisors will be required to sign a declaration of originality form to confirm that no work described in the thesis has been defended previously in any other thesis at either Brock or elsewhere,

The Faculty of Graduate Studies also has outlined specifications for the format of theses that can be accessed by clicking on the following link:

<http://www.brocku.ca/gradstudies/forms/thesis-format/SpecificationsAndTableOfContents-06-08.pdf>. *The policy of the Chemistry Department is that MSc and PhD theses must be prepared in the traditional format.*

Please note that after the final draft of the thesis has been submitted to the Graduate Program Director, the student will be required to deposit with the supervisor all laboratory notebooks, together with all other original data records, spectra, samples, etc. These will be retained as the property of the supervisor or the Brock Department of Physics, as appropriate.

All typing and other costs of preparing the thesis are the responsibility of the student.

12. First Draft Status

Brock students should consult the faculty of graduate studies website at the following link to

determine the appropriate submission deadline for the final stage status form:

<https://brocku.ca/important-dates/graduate-studies/>

Students can request a copy of the first draft status form from the GPD, or download it directly from the following link: <https://brocku.ca/mathematics-science/wp-content/uploads/sites/26/Final-Stage-Status-Form-August-2017-ff.pdf>

What constitutes an acceptable first draft is described as follows:

- (1) ALL chapters of the thesis had the MAJORITY of text written for them. The thesis need not have been proofread.
- (2) There must be a table of contents
- (3) List of figures or a reference/bibliography section need not be fully prepared. All figures need not be present or spectra or spectral assignments or full appendices.
- (4) Students should have an experimental or, where relevant, theoretical methods section drafted. For the former, this does not mean that every single compound is fully characterized and all entries present, just that the MAJORITY of the experimental is present. Similarly, for the case of work done in theoretical chemistry/biotechnology, the MAJORITY of the theoretical methods section is present.
- (5) The draft should be at least 75-80% complete in all components.

Students should email or hand in a hard copy of the completed form together and an electronic (pdf) copy of their thesis to the GPD **at least one week before the deadline**. The GPD will review the thesis and if everything is in order, sign and return the completed form the graduate studies. Students submitting these forms late will likely not be granted first draft status. Note, students are not required to get feedback from their supervisory committee in order to be granted first draft status.

First draft status is normally only granted for one semester since the expectation is for the student to have successfully defended at the end of this time period.

13. Thesis and Defence Procedures for MSc & PhD Theses in the Department of Chemistry¹

This information together with the appropriate forms can be found at the following link: <https://brocku.ca/mathematics-science/chemistry/graduate-programs/msc-phd-thesis-submission-guidelines/>

Stage 1.

When the student's supervisory committee judges the student to be near completion of his/her program (based on a recent biannual progress meeting, a review of a preliminary draft of the

thesis and, for PhD candidates, successful completion of the candidacy exam), a written request for final defence will be made to the Graduate Program Director (GPD) using the appropriate External Examiner Approval Form provided by the Faculty of Graduate Studies for PhD exams and the Faculty of Mathematics and Science for MSc exams. If any additional requests are required (e.g., a request for a closed examination, addition of members to the examining committee, etc.) they will be made at this time.

Stage 2.

If the GPD agrees with the assessment of the supervisory committee as to the student's readiness to defend, he/she will vet the choices of external referee and sign and forward the form to the Associate Dean of Graduate Studies for PhD exams or the Associate Dean of Mathematics and Science for MSc exams.

Stage 3.

If any of the proposed external examiners or their ranking is deemed to be unacceptable by the Associate Deans on academic grounds, he/she will inform the GPD and provide an explanation. The GPD will then ask the supervisor to produce and submit a revised list that takes the Dean's concerns into account. If the Dean has concerns regarding travel costs of a proposed external examiner, he/she will contact the GPD to discuss the possibility of cost sharing with the Chemistry Department.

Stage 4.

After receiving approval from the appropriate Dean, the Graduate Administrative Coordinator (Elena Genkin) will contact the external examiner and other examining committee members to finalize the date of the exam. The composition of the committee will be as follows:

- a. Thesis supervisor
- b. Members of the Supervisory Committee
- c. Chair of the Examination Committee (Chosen by the Dean in consultation with the GPD. Normally this will be the GPD or designate)
- d. An examiner internal to Brock but external to the student's program (selected by the GPD)
- e. The External Examiner

Stage 5.

Two months prior to the examination date the graduate student will submit an electronic pdf copy of their thesis to the supervisory committee for feedback to determine whether is suitable to send out to the external examiner. If major revisions are required such that the thesis cannot be ready or suitable for examination within two weeks, the examination will be cancelled, and the supervisory committee will meet with the student to determine a new schedule for completion of the thesis.

Stage 6.

No later than six weeks (30 working days) before the scheduled the completed External Examiner approval form (MSc) or the PhD defence External Examiner Approval Form and PhD sign off forms should be submitted together with an electronic pdf copy of the thesis to the Graduate Administrative Coordinator (Elena Genkin). The graduate student and supervisor will also then be required to sign a declaration of originality form which students can request from Elena Genkin.

Note if specifically requested by the external examiner or member(s) of the examination committee one or more hard copies of your thesis maybe required. It is advisable for students to check with their supervisory committee members around the time of submission to establish whether or not hard copies of their thesis are required.

Stage 7.

Following the defence, and assuming no major problems, the student will submit the final revised copy of the thesis to his/her supervisor within the timeframe given at the end of the exam.

¹Includes MSc and PhD theses in Biotechnology for which the supervisor is a member of the Department of Chemistry.

Please note: one week prior to the exam the GPD will receive feedback from the external examiner regarding whether or not the thesis can go ahead as planned together with a summary of general comments pertaining to the suitability and quality of the work described in the thesis. These comments will be passed onto the candidate prior to the defence.

14. Format of Chemistry MSc Thesis Defence

- Exam Chair introduces committee and candidate, explains the format of the defence.
- Candidate presents a research seminar, around 30 minutes in length.
- Floor is open to questions from the general audience.
- This is followed by a short break. If previous arrangements have been approved for a closed defence, the general audience is asked to depart. If the defence is open, the members of the general audience are permitted to remain, but may not ask questions.
- Order of questioning is usually external examiner, 1st departmental thesis committee member, 2nd departmental thesis committee member, supervisor. The chair of the examining committee is not required to participate in the questioning period, but may do so.
- The questioning period will be limited to 2 hours, normally consisting of two

rounds of questioning by the examining committee.

- When the committee is satisfied with the questioning, the Chair thanks the candidate, who then leaves the room so that the Committee may deliberate *in camera*.

Possible outcomes of the exam

All members of the examining committee, excluding the committee chair, will vote on the outcome of the exam, for a total of 4 votes.

Fail - at least 3 members of the committee vote
to fail Pass - at least 3 members of the
committee vote to pass

In the event of a tie vote, the vote of the external examiner will be the outcome of the exam.

15. Format of Chemistry PhD Thesis Defence

- Exam chair introduces committee and candidate, explains the format of the defence.
- Candidate presents a research seminar, around 30 minutes in length.
- Floor is open to questions from the general audience.
- This is followed by a short break.
- The oral defence proceeds. General audience may remain but may not ask questions.
- Order of questioning is usually external examiner, internal examiner, 1st departmental thesis committee member, 2nd departmental thesis committee member, supervisor. The chair of the examining committee is not required to participate in the questioning period but may do so.
- The questioning period will be limited to 2 hours, normally consisting of two rounds of questioning by the examining committee.
- When the committee is satisfied with the questioning, the Chair thanks the candidate and the audience, who then leave the room so that the Committee may deliberate *in camera*.

Possible outcomes of the exam

All members of the examining committee, excluding the committee chair, will vote on the outcome of the exam, for a total of 4 votes.

Fail - at least 3 members of the committee vote
to fail Pass - at least 3 members of the
committee vote to pass

In the event of a tie vote, the vote of the external examiner will be the outcome of the exam.

16. Appendix A. Important Links

Graduate Calendar: <http://www.brocku.ca/webcal/2008/graduate/>

Faculty of Graduate Studies Forms: <http://www.brocku.ca/gradstudies/current/forms.php>

Graduate Students' Association (GSA): <http://www.brocku.ca/gsa/>

Graduate Student Professional Development: <http://www.brocku.ca/gradstudies/gspd/>

Senate Graduate Studies Committee: <http://www.brocku.ca/secretariat/senate/index.php>

Academic Regulations and Policies: <http://www.brocku.ca/gradstudies/current/policies.php>

Academic Integrity: <http://www.brocku.ca/academicintegrity/>

Other resources: <http://www.brocku.ca/gradstudies/current/resources.php>

17. Appendix B. PhD Candidacy Exam Proposal Guidelines

General Information

Detailed instructions for how to prepare the candidacy proposal and the candidacy exam procedures can be found on the chemistry website at: <https://brocku.ca/mathematics-science/chemistry/graduate-students/phd-candidacy-exam/>

Students are strongly advised to **make full use** of the allocated space when writing the various sections of the proposal. Weak proposals that lack sufficient depth and detail will be returned to the candidate for further revision.

The submission procedure is as follows:

1. An electronic copy of the completed proposal in pdf format should be submitted to the GPD and the supervisory committee (including the supervisor) no later than two weeks prior to the scheduled examination. Each examiner will evaluate the written proposal, complete the evaluation form and deliver it to the Graduate Officer (Elena Genkin) no later than 48 hours prior to the examination.
2. If the proposal is deemed to be acceptable the GPD will inform the committee and the candidate that the examination will proceed as scheduled. If the examining committee find the proposal to be unacceptable, the examination will be postponed, and the student will be asked to re-write it.

. The proposal consists of the following parts:

- An application form (see below for more detail). The form has the following sections:
 - Application profile
 - Plain language summary of the proposal

- Proposed expenditures
- Free form sections in the following order
 - Budget justification (1-2 pages)
 - Literature review and background (5 pages maximum)
 - Proposal (5 pages maximum)
 - References (2 pages maximum)

General Presentation

When you prepare your application, follow these guidelines:

- Print must be in good quality black ink and legible.
- Text must be single-spaced, with no more than six lines per inch.
- The accepted font is Times New Roman regular 12 pts, or any comparable font – nothing smaller.
- Condensed font, and applications completed strictly in italics, are not acceptable.

Free Form Sections:

- Use white paper, 8 1/2 × 11 in (21.5 cm × 28 cm), portrait format, with a single column.
 - Set margins at 3/4 of an inch (1.9 cm) (minimum) all around.
 - Enter your name and student number at the top of every page, outside the set margins.
 - Number your pages sequentially.
 - Print on one side of the page only.
 - Avoid using acronyms and abbreviations or explain them fully.
- Adhere strictly to the page limits given above. Pages in excess of the number permitted will be removed!

Note

All text, including references, must conform to these standards. Incomplete proposal and/or proposals that do not meet the presentation standards will be returned and the examination will be postponed until corrections are made.

Completing the application form

- Obtain the pdf file
(www.brocku.ca/chemistry/graduate/Candidacy%20Examination/Proposal%20budget%20form.pdf)
- Use Adobe Acrobat or Acrobat Reader to fill out the form and print it. (**Note: Acrobat Reader will not let you save the filled-out form**)

1. Title of Proposal

The title should describe the subject of the research to be supported. It should not contain a company or trade name. Spell out scientific symbols and acronyms.

2. Research Subject Code

Consult the NSERC Code Tables.

3. Key Words

Provide a maximum of 10 key words that describe the proposal.

4. Certification

Requirements Ignore this section.

5. Plain Language Summary

The summary is intended to explain the proposal in **language that the public can understand. Using simple terms, briefly describe** the nature of the work to be done. Indicate why and to whom the research is important, the anticipated outcomes, and how your field and Canada will benefit. If you wish, you may also provide a summary in the second official language in the text box identified for that purpose.

6. Proposed Expenditures

Before completing this section, consult the Use of Grant Funds section of the NSERC *Program Guide for Professors* for information about the eligibility of expenditures for the direct costs of research and the regulations governing the use of grant funds. Use the Budget Justification section (free form section) to explain and justify each budget item. Provide a five-year budget

Free form sections

1. **Budget Justification**

Provide a detailed explanation and justification for each budget item identified in the Proposed Expenditures section. Provide sufficient information to allow reviewers to assess whether the resources requested are appropriate.

○ Salaries and benefits

You should request funding for one or two PhD students and undergraduate summer students as needed for your project. Give a salary of \$12,000/yr (research

supervisor's portion) for each PhD student and a stipend of \$7,000 for each summer student.

(**Note:** this section should be worked into the projects described in your proposal where you can highlight which project is suitable to which level of student training.)

- Equipment or facility
Give a breakdown of the items requested, models, manufacturers and prices. Justify each item requested. Items costing more than \$7,000 may not be included in a Discovery Grant application. If your research proposal requires such items you may assume that they are either already available or have been applied for under the Research Tools and Instruments program. Also report the need for beam time or other special facilities, and how much time has been allocated for these.
- Materials and supplies
Provide details and explain major items.
- Travel
Explain briefly how each activity relates to the proposed research.
- Dissemination
Provide details of publication costs, user workshops or other activities.
- Other expenses
List all items not relevant to previous categories and provide a brief explanation for major items.

2. Literature Background

In a maximum of five (5) single-sided pages describe the following:

- the over-arching goals of research in the field of the proposal;
- recent progress in attaining those goals; and
- specific issues in the literature pertinent to the proposal

Proposal

Using the headings below and in a maximum of five (5) single-sided pages, describe the research to be supported. Provide details on:

- objectives of the research program – both short- and long-term;
- methods and proposed approach;
- anticipated significance of the work; and
- training to take place through the proposal.

Images and graphics are included in the above-mentioned page limitations.

3. References

- Use this section to provide a list of literature references. Your list of references should not exceed one 2 pages on the printed copy.
- Do **not** refer readers to Web sites for additional information on your proposal.
- Do not introduce hyperlinks in your list of references.