Welcome to the Doctoral Program in Medicinal Chemistry at the University of Minnesota. The graduate faculty are delighted to have you here and we hope that the time you spend in the program will be challenging and rewarding. The procedures and policies described in the following pages are designed to help you become familiar with departmental guidelines and program requirements. Responsibility lies with the graduate student to initiate and carry out the necessary steps essential to the progress and ultimate completion of their respective graduate program. Students also should consult the General Information section of the Graduate School Catalog or the Graduate School website at http://www.grad.umn.edu/ for pertinent Graduate School requirements and policies and procedures.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front matter</td>
<td>1</td>
</tr>
<tr>
<td>Contents</td>
<td>2</td>
</tr>
<tr>
<td>Program Overview</td>
<td>3</td>
</tr>
<tr>
<td>Program Components</td>
<td>3</td>
</tr>
<tr>
<td>• Ph.D. Degree</td>
<td>3</td>
</tr>
<tr>
<td>• Plan A M.S. Degree</td>
<td>3</td>
</tr>
<tr>
<td>Degree Requirements</td>
<td>3</td>
</tr>
<tr>
<td>• Maintaining Active Student Status</td>
<td>3</td>
</tr>
<tr>
<td>• Coursework Requirements for Ph.D.</td>
<td>3</td>
</tr>
<tr>
<td>1. Remedial Coursework</td>
<td>4</td>
</tr>
<tr>
<td>2. Program Coursework</td>
<td>4</td>
</tr>
<tr>
<td>3. Student Seminars</td>
<td>5</td>
</tr>
<tr>
<td>• Coursework Requirements for Plan A M.S.</td>
<td>5</td>
</tr>
<tr>
<td>• Limitations on the Use of S/N Credits</td>
<td>6</td>
</tr>
<tr>
<td>• Limitations on the Use of Transfer Credits</td>
<td>6</td>
</tr>
<tr>
<td>Degree Completion Steps</td>
<td>7</td>
</tr>
<tr>
<td>Doctoral Candidacy Requirements</td>
<td>9</td>
</tr>
<tr>
<td>Doctoral Degree Requirements</td>
<td>9</td>
</tr>
<tr>
<td>Preliminary Written Examination</td>
<td>9</td>
</tr>
<tr>
<td>Preliminary and Final Oral Examining Committees</td>
<td>10</td>
</tr>
<tr>
<td>Research Proposal</td>
<td>10</td>
</tr>
<tr>
<td>• Deadline and manner of submission of research proposal</td>
<td>11</td>
</tr>
<tr>
<td>Thesis Research Presentation</td>
<td>12</td>
</tr>
<tr>
<td>Thesis Preparation</td>
<td>12</td>
</tr>
<tr>
<td>Requirements for Graduation</td>
<td>12</td>
</tr>
<tr>
<td>Degree Completion Deadlines</td>
<td>13</td>
</tr>
<tr>
<td>Departmental, Collegiate, and University Policies</td>
<td>13</td>
</tr>
<tr>
<td>• Academic Standards</td>
<td>13</td>
</tr>
<tr>
<td>• Annual Review of Student Progress</td>
<td>13</td>
</tr>
<tr>
<td>• Selection of Advisor</td>
<td>14</td>
</tr>
<tr>
<td>• Responsibilities</td>
<td>14</td>
</tr>
<tr>
<td>• Opportunities for Student Involvement</td>
<td>14</td>
</tr>
<tr>
<td>• Standards of Ethical Conduct</td>
<td>15</td>
</tr>
<tr>
<td>• Departmental Seminars and Special Lectures</td>
<td>15</td>
</tr>
<tr>
<td>• Laboratory Security and Safety</td>
<td>15</td>
</tr>
<tr>
<td>• Ordering of Supplies, Equipment and Animals</td>
<td>16</td>
</tr>
<tr>
<td>• Equipment and Utility Repairs</td>
<td>16</td>
</tr>
<tr>
<td>• Medicinal Chemistry Travel Policy</td>
<td>16</td>
</tr>
<tr>
<td>• Medical Scientist Training Program-MD/PhD Program</td>
<td>16</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td>17</td>
</tr>
<tr>
<td>• Email Communications</td>
<td>17</td>
</tr>
<tr>
<td>• Copying Equipment</td>
<td>17</td>
</tr>
<tr>
<td>• MIKI Meeting</td>
<td>17</td>
</tr>
<tr>
<td>• Vacations and Breaks</td>
<td>17</td>
</tr>
<tr>
<td>Appendix</td>
<td>18</td>
</tr>
</tbody>
</table>
PROGRAM OVERVIEW
The mission of the Department of Medicinal Chemistry Graduate Program is to provide graduate students, as well as postdoctoral fellows and visiting scientists, with a firm academic foundation and research experience in medicinal chemistry with emphasis in physicochemical and theoretical structure-based drug design, synthetic organic chemistry, molecular modeling, and molecular mechanisms of drug action and chemical toxicology, in order to prepare them for careers as scientists in the pharmaceutical industry and in government laboratories or as educators in colleges and universities.

PROGRAM COMPONENTS
Ph.D. Degree. The Ph.D. is the degree for which students are admitted to the Medicinal Chemistry graduate program. Students must first complete the requirements for doctoral candidacy in satisfying the requirements for completing a Ph.D. Details about these requirements can be found under Degree Requirements. The Medicinal Chemistry graduate program does not require a minor. However, if a student decides to pursue a minor as part of their degree program, the minor must be declared on the degree plan prior to taking the preliminary oral exam.
Plan A M.S. Degree. Sometimes students who have entered the Ph.D. program decide that they would rather obtain an M.S. degree. To accomplish this a transfer to the M.S. degree program (Plan A only) is required. Additional details about completing a Plan A M.S. degree can be found under Degree Requirements.

DEGREE REQUIREMENTS
Maintaining Active Student Status. The Graduate School requires that students register every Fall and Spring term to maintain active status up through and including the term in which you will complete your degree. Failure to maintain active status will result in discontinuation of student status and require applying for readmission.

Coursework Requirements for Ph.D. For the doctoral program in Medicinal Chemistry, students must complete a minimum of 24 credits of required and elective graduate (5000 or 8000) level coursework and 24 Doctoral Thesis Credits (MedC 8888). This coursework and thesis credit requirements are generally completed during the first two years of study. A typical course sequence is illustrated below.

After their first semester in the program, students should register for a maximum of 14 credits of graduate level coursework and/or MedC8888 thesis credits each semester until they have completed their thesis credit requirement. Under no circumstances should a student register for more than 14 credits in a semester without approval from either the Director of Graduate Studies (DGS) or their advisor, as this entails significant additional tuition costs. Tuition support will not be provided for elective coursework unrelated to furthering graduate education.

After two years, some students may be in a situation where they have completed all of their course requirements and they need less than 6 credits to complete their thesis requirements. In this situation, students will need to register for 6 credits of MedC 8888 thesis credits to retain their full-time status. Once students have completed their thesis credit requirement and have met
the other advanced doctoral student status requirements, they will begin in the following semester to register for a specific one-credit registration (MedC 8444) that certifies the student as full-time. Until the student has a research advisor, the DGS will approve all registrations. **It is a program requirement that before registering each semester students must consult with and obtain the approval of either their advisor or the DGS.**

1. **Remedial Coursework.** Sometimes a student is admitted to the Medicinal Chemistry graduate program with specific course deficiencies. Such deficiencies need be made up as soon as possible, preferably during the first year of residence. For example, if the deficiency is physical chemistry, the student will take Chem 4501 (3 cr) or its equivalent. In the case of other course deficiencies, the Director of Graduate Studies will determine the appropriate course to fulfill the deficiency.

2. **Program Coursework.** The minimum of 24 credits of instruction must include required courses below, two MedC electives, one approved BioC elective, and one other elective.

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MedC 8001 (3 credits)</td>
<td>MedC 8002 (3 credits)</td>
<td>Written Preliminary Examination (generally the last Thursday &amp; Friday in the month of June)</td>
</tr>
<tr>
<td>Chem 8321 (4 credits)</td>
<td>MedC 8435 (1 credit)</td>
<td></td>
</tr>
<tr>
<td>MedC 8050 (2 credits)</td>
<td>Chem 8066 (1 credit)</td>
<td></td>
</tr>
<tr>
<td>Elective Course or Biochemistry Requirement (5 credits available)</td>
<td>Elective Courses and/or Biochemistry Requirement MedC 8888 Doctoral Thesis Credits (9 credits available)</td>
<td></td>
</tr>
</tbody>
</table>

**Required Courses**

**Discretionary Credits Available**
From those credits, students must select:

1. One Biochemistry Course from the List or Approved by DGS and advisor (3-4 credits)
2. Two Elective Courses from the Dept. of Medicinal Chemistry (5-6 credits)
3. One Elective Course from inside or outside the Dept. of Medicinal Chemistry (3-4 credits)

Remaining credits are used for other courses, such as additional electives, NSF fellowship class, etc.

**Required Thesis Credits**
MedC 8888 Doctoral Thesis Credits

The following are required courses for the doctoral program in Medicinal Chemistry.

- MedC 8001 General Principles of Medicinal Chemistry I 3 cr
- MedC 8002 General Principles of Medicinal Chemistry II 3 cr
- MedC 8050 Mechanistic Organic Chemistry 2 cr
- MedC 8435 BioAssay & Data Analysis 1 cr
- MedC 8100 Seminar 1 cr
- Chem 8321 Organic Synthesis I 4 cr
- Chem 8066 Professional Conduct of Chemical Research 1 cr
- MedC 8888 Doctoral Thesis 24 cr

**Students are required to take three additional courses, two of which must be from the list below.**

- MedC 8070 Chemistry and Biology of Infectious Diseases 3 cr
- MedC 8401 The Chemistry of Counterterrorism 3 cr
- MedC 8413 Chemistry of Nucleic Acids 3 cr
- MedC 8420 Natural Products Chemistry 3 cr
Below is a list of approved courses to satisfy the biochemistry requirement. Students may use other courses not listed here to complete their biochemistry requirement with the approval of the DGS and their advisor.

BioC 8005  Biochemistry: Structure and Catalysis  2 cr
BioC 8006  Biochemistry: Metabolism and Control  2 cr
BioC 5535  Intro to Modern Structural Biology-Diffraction  2 cr
BioC 5528  Spectroscopy and Kinetics  4 cr
GCD 8151  Cell Structure & Function  3 cr
Chem 8411  Intro to Chemical Biology  4 cr

3. **Student Seminars.** Each graduate student is required to present two seminars as part of their degree program. The first seminar is given in the second year and shall cover a topic from the literature that will be either assigned by the faculty or chosen by the student and approved by the student’s advisor and the professor in charge of the seminar program. For this seminar, students shall register for 1 credit of MedC 8100 (A–F grade option) during the semester she/he gives the seminar. This seminar credit will be used as part of the student’s official degree program. The second seminar will be given during the summer of the third year and it will cover the student’s research. You will not register for any credit for this seminar. For both seminars, the professor in charge of the seminar program will arrange the seminar schedule and will assign the dates of the seminars.

**Coursework Requirements for Plan A M.S.** Sometimes students who have entered the Ph.D. program decide that they would rather obtain an M.S. degree. To accomplish this, a transfer to the M.S. degree program (Plan A only) is required. Such a transfer is not automatic, and it must be approved by the student’s advisor, the Director of Graduate Studies, and the Graduate School. To complete a Plan A M.S., the student must complete a minimum of 20 credits of instruction, including required courses below, one MedC elective, and one approved BioC elective, and 10 credits of Masters Thesis (MedC 8777), The Graduate School minimum GPA requirement for courses included on any official master’s degree program must be met. If a transfer is approved, the following course requirements must be met to constitute the student’s official degree program. The Graduate School requires 10 thesis credits and 20 didactic credits.

- Required courses for Plan A MS
  MedC 8001  General Principles of Medicinal Chemistry I  3 cr
  MedC 8002  General Principles of Medicinal Chemistry II  3 cr
  MedC 8050  Recitation in Mechanistic Organic Chemistry  1 cr
  Chem 8066  Professional Conduct of Chemical Research  1 cr
  Chem 8321  Organic Synthesis  4 cr
  MedC 8777  Master Thesis  10 cr
• Students must take an additional course from one of the following courses:
  MedC 8070 Chemistry and Biology of Infectious Diseases 3 cr
  MedC 8401 The Chemistry of Counterterrorism 3 cr
  MedC 8413 Chemistry of Nucleic Acids 3 cr
  MedC 8420 Natural Products Chemistry 3 cr
  MedC 8461 Design of Cancer Immunotherapeutics 3 cr
  MedC 8700 Advanced Concepts in Medicinal Chemistry 2 cr
  MedC 8753 Molecular Targets of Drug Discovery 3 cr
  Chem 8322 Organic Synthesis II 4 cr

Below is a list of approved courses to satisfy the biochemistry requirement. Students may use other courses not listed here to complete their biochemistry requirement with the approval of the DGS and their advisor.
  BioC 8005 Biochemistry: Structure and Catalysis 2 cr
  BioC 8006 Biochemistry: Metabolism and Control 2 cr
  BioC 5535 Intro to Modern Structural Biology-Diffraction 2 cr
  BioC 5528 Spectroscopy and Kinetics 4 cr
  GCD 8151 Cell Structure & Function 3 cr
  Chem 8411 Intro to Chemical Biology 4 cr

Limitations on the Use of S/N Credits. Except for MedC 8800, all courses that will constitute the student’s official degree program must be taken on the A/F basis.

Limitations on the Use of Transfer Credits. Transfer credits from other graduate programs for non-MedC courses will be considered at the discretion of the DGS. A maximum of two courses may be considered for transfer of credit. A letter requesting transfer credits must be submitted to the Director of Graduate Studies during the first week of the student’s first term at the University of Minnesota, and should briefly explain why transfer credits are being requested. An A or B grade is required for transfer credit to be considered. The letter must be accompanied by the syllabus, exams, and any other relevant materials for the course to be transferred. The DGS will solicit advice from the Course Director for which transfer credit is being requested as to whether the courses are equivalent. The final decision for transfer credit approval will be made by the DGS, and a letter communicating the decision to the student will be placed in that student’s file. If transfer credit is approved, coursework from another institution being used to fulfill degree requirements should be included on the GDP/GPAS. An official transcript should be attached to the form, unless a transcript showing that coursework is already on file at the Graduate School.
Degree Completion Steps Entry Pre Fall 2018

Below is a brief overview. Each step is discussed in greater detail later in this document.

In order to receive your degree, the following procedures must be completed. You must maintain active student status by registering every fall and spring semester until your degree is awarded. All forms must be submitted to the Graduate Student Services and Progress (GSSP) office unless otherwise noted. Contact your graduate program office for program-specific requirements and deadlines.

1. **Complete Preliminary Written Exam**
   - Program staff report results to GSSP. Must be on file with GSSP to be authorized to take preliminary oral exam.

2. **Complete Graduate Degree Plan**
   - Submit at least one semester prior to your preliminary oral exam.

3. **Assign members to preliminary oral exam committee**
   - Complete at least one semester prior to exam via [www.grad.umn.edu/students/forms/doctoral/index.html](http://www.grad.umn.edu/students/forms/doctoral/index.html)

4. **Schedule Preliminary Oral Exam**
   - Notify GSSP of scheduled exam at least one week in advance.

5. **Submit Preliminary Oral Report**
   - Submit for your record to reflect doctoral candidacy.

6. **Assign members to doctoral final exam committee**
   - Complete at least one semester prior to exam via [www.grad.umn.edu/students/forms/doctoral/index.html](http://www.grad.umn.edu/students/forms/doctoral/index.html)

7. **Download Graduation Packet**
   - Packet will include the Graduate Application for Degree form and Reviewers’ Report form.

8. **Schedule Doctoral Final Exam**
   - Notify GSSP of scheduled exam at least one week in advance.

9. **Submit Application for Degree**
   - Apply by the first day of anticipated month of graduation. Instructions here: [https://www.grad.umn.edu/current-students-graduate-student-services-progress/application-degree](https://www.grad.umn.edu/current-students-graduate-student-services-progress/application-degree)

10. **Submit Reviewers’ Report**
    - Submit prior to your defense.

11. **Submit Doctoral Final Exam Report**
    - Submit no later than the last business day of anticipated month of graduation.

12. **Submit dissertation/project**
    - Submit by the last business day of anticipated month of graduation. Consult Graduation Packet for formatting guidelines.

**Questions?**

Contact the Graduate Student Services and Progress office
(333 Robert H. Brininks Hall)
[http://www.grad.umn.edu/students/doctoral/index.html](http://www.grad.umn.edu/students/doctoral/index.html)

Degree/Progress & Final Exams
[gsps@umn.edu](mailto:gsps@umn.edu)
612-626-3400
Degree Completion Steps Entry Fall 2018 or Later
Below is a brief overview for students entering in or after Fall 2018. Each step is discussed in greater detail later in this document.

DEGREE COMPLETION STEPS
Doctor of Philosophy
Doctor of Education

Students eligible to use the Graduate Planning & Audit System will follow the degree completion steps below. Contact Graduate Student Services and Progress if you are unsure whether you are completing your degree using the Graduate Planning & Audit System or paper Graduate Degree Plan.

In order to receive your degree, the following steps must be completed. You must maintain active student status by registering every fall and spring semester until your degree is awarded. Contact your program advisor for program-specific requirements and deadlines.

1. Submit Graduate Planning & Audit System (GPAS) planner
   Submit at least one semester prior to your preliminary oral exam.

2. Complete Preliminary Written Exam
   Program staff report results to GSSP. Must be on file with GSSP to be authorized to take preliminary oral exam.

3. Assign members to preliminary oral exam committee
   Complete at least one semester prior to exam at: https://onestop.umn.edu/examination-committees

4. Schedule preliminary oral exam
   Notify GSSP of scheduled exam at least one week in advance.

5. Submit Preliminary Oral Report
   Submit for your record to reflect doctoral candidacy.

6. Assign members to doctoral final exam committee
   Complete at least one semester prior to exam at: https://onestop.umn.edu/examination-committees

7. Download Graduation Packet
   Packet will include the Graduate Application for Degree form and Reviewers' Report form.

8. Schedule doctoral final exam
   Notify GSSP of scheduled exam as soon as the date is set but no later than one week in advance.

9. Submit Application for Degree
   Apply to graduate no later than the first day of the anticipated month of graduation. Application instructions are available: https://onestop.umn.edu/academics/apply-graduate

10. Submit Reviewers' Report
    Submit prior to your defense.

11. Submit Doctoral Final Exam Report
    Submit no later than the last business day of anticipated month of graduation.

12. Submit dissertation/project
    The dissertation must be submitted and approved by GSSP by the last working day of the anticipated month of graduation. Please plan accordingly. Consult Graduation Packet for formatting guidelines: https://onestop.umn.edu/thesisdissertation-submission-and-formatting

Questions? Contact Graduate Student Services and Progress office (333 Bruininks Hall)
gssp@umn.edu
(612) 625-3480
https://onestop.umn.edu/contact-gssp

OTR204G - 8/17
**Doctoral Candidacy Requirements.** A student is admitted to candidacy for the Ph.D. degree only after passing a preliminary oral examination. All of the following steps must be completed before this examination can be scheduled. For an overview of the process, please refer to the following document.

[http://www.grad.umn.edu/sites/grad.umn.edu/files/grad_content_446220_0.pdf](http://www.grad.umn.edu/sites/grad.umn.edu/files/grad_content_446220_0.pdf)

1. Completion of an initial two academic semesters of study with a minimum GPA of 3.0 and observation in the department in order to become acquainted with the research programs and interests of the graduate faculty. Until a research advisor is chosen, the Director of Graduate Studies will act as the students' advisor and will suggest coursework and approve the students' registration.

2. Selection of a major advisor as described under *Selection of Advisor* no later than the end of spring break (year one) and, in consultation with the advisor, laying out a program of coursework that will meet the departmental core requirements and any special interests of the student. Usually a research problem will be decided upon as well, permitting early exposure to research procedures.

3. Submission of the Degree Program Form to the Graduate School as directed at the Graduate School website at [policy.umn.edu/forms/otr/otr198.pdf](http://policy.umn.edu/forms/otr/otr198.pdf).

4. Provide evidence of satisfactory aptitude for research. Such evidence will normally be presented by the major advisor to the graduate faculty, and is important for further progress in the program.

5. Successful completion of the preliminary written examination, as described below. Once this occurs, the score will be submitted to the Graduate School by departmental staff.

6. Successful completion of an original research proposal as designated under *Research Proposal*.

**Doctoral Degree Requirements.** Requirements for the Ph.D. degree following admission to candidacy are:

1. Filing of the appropriate forms with the Graduate School as directed at the Graduate School website at [http://www.grad.umn.edu/sites/grad.umn.edu/files/1%20PhD_EdD%20sample%20grad%20packet.pdf](http://www.grad.umn.edu/sites/grad.umn.edu/files/1%20PhD_EdD%20sample%20grad%20packet.pdf) in addition to the below steps.

2. Completion of a satisfactory research project.

3. Preparation of a written thesis based on the research project.

4. Approval of the thesis by the thesis committee.

5. Presentation of a thesis research seminar to which the scholarly community is invited and passing the final oral examination by successfully defending the thesis.

**Preliminary Written Examination.** By July 1 of their first year, all first year students are required to take and pass a comprehensive written examination. If a student fails to pass the examination, the student will be allowed to re-take the exam by arrangement with the Chair of the comprehensive written examination committee by August 15th. It is an expectation that the minimum requirements for passing the re-take exam will exceed those for the first exam. The examination will cover course and seminar related materials. Students who pass the examination must submit by June 1 of their second year an original research proposal (see below) for defense at a preliminary oral examination. Failure to pass the exam constitutes grounds to terminate.

**Preliminary and Final Oral Examining Committees.** These two committees will each consist of three medicinal chemistry graduate faculty, one of whom is the student’s advisor, plus one
faculty member from outside the major or if a minor has been declared from the minor field. The membership of the two committees must be developed and approved by the student’s advisor and must consist of Graduate School eligible examiners. Approval of each committee membership by the Director of Graduate Studies is required.

Research Proposal. Students are required to prepare an original research proposal in the format required by the NIH. The proposal shall be submitted by June 1 of the second year after completion of the preliminary written examination. The procedure for fulfilling this requirement is as follows:

1. Select a topic for your research proposal. The proposal must be original. It should not be related to your thesis research, to ongoing research projects in the Department, or to any other research project you were involved with outside the Department.

2. The draft of the proposal should be submitted on the NIH grant application form PHS398. In the preparation of your proposal, follow the most recently revised instructions. Forms are available from the NIH website. You do not need to include the budget pages. NIH has recently made significant revisions to proposal requirements, and the student is responsible for ensuring that current instructions are followed. Please see the following document for additional information: https://grants.nih.gov/grants/funding/phs398/phs398.html

3. The general format requirements should be followed: Arial, Helvetica, Palatino Linotype or George font typeface of 11 or 12 point size. A symbol font may be used for Greek or special characters. Margins should be at least 0.5 inches on all sides, and text should be single-spaced. References cited should be cited using numerical or author/date format. If numerical citations are used, each reference should be cited with a separate number.

4. The proposal should consist of four sections within the following page limits: (1) Face Page (1 page), (2) Specific Aims (1 page), (3) Research Strategy (12 pages), and (4) Bibliography and References Cited (no page limit).

5. The Face Page 1 form should be downloaded from the NIH website. Fields 1, 2, 3a–g should be completed.

6. The Specific Aims section should include the following as described in NIH Instructions for PHS 398:

“State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved. List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.”

Two or three aims are usually suitable for a proposed project.

7. The Research Strategy section (12-page limit) should consist of three sub-sections with separate headers within the following page limits: (1) Significance (1/2 page), (2), Innovation (1/2 page), and (3) Approach (11 pages). This section should include the following as described in NIH Instructions for PHS 398:
“Significance – Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses. Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields. Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

Innovation – Explain how the application challenges and seeks to shift current research or clinical practice paradigms. Describe any novel theoretical concepts, approaches or methodologies, instrumentation or interventions(s) to be developed or used, and any advantage over existing methodologies, instrumentation or intervention(s). Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation or interventions.

Approach – Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims. Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised.”

The Approach sub-section should be organized and presented in the order of the aims described in the Specific Aims section.

8. References listed in the Bibliography and References Cited section should be in the *J. Med. Chem.* format and journal references must include the names of all authors, article title, journal title, year of publication, volume number, and inclusive page numbers. Although there is no page limit, references should be limited to literature that is current and relevant to the proposed research.

9. The completed proposal must be electronically submitted to the Director of Graduate Studies and the preliminary oral examination committee by June 1. The deadline will be strictly enforced with exceptions made by the DGS for university related activities, family or medical emergencies only.

10. The preliminary oral examination will consist of two parts: (1) a brief 15 minute summary of research progress, and (2) a 30 minute formal presentation of the research proposal followed by discussion and questions. The student should expect, however, that questioning may drift away from the specific proposal. Questioning on unrelated material is not precluded when a member of the committee deems such questioning to be desirable.
11. In evaluating the student's performance, the members of the preliminary oral examination committee will assess five principal areas:

- **Significance:** (1) Is the subject matter timely and important? (2) Will the successful completion of the proposed research constitute a non-trivial extension of current understanding?
- **Scientific Background:** (1) Has an adequate search and evaluation of background literature been undertaken?
- **Experimental Approach:** (1) Have appropriate methods, techniques, and reactions been selected? (2) Have weak points been identified and alternative approaches proposed? (3) Is the approach creative?
- **Presentation:** (1) Have the goals of the proposed research been clearly stated? (2) Was the presentation organized, logical, coherent, and convincing?
- **Defense:** (1) Have questions arising during the exam been satisfactorily addressed? (2) Has the candidate overall shown him- or herself to be sufficiently well versed in medicinal chemistry to carry out the proposed research?

**Thesis Research Presentation.** As part of a student’s final oral examination, she/he will present a seminar on their thesis research to which the scholarly community is invited. This seminar may take place only after the Thesis Reviewers Report form has been completed by the final oral examination committee members who serve as reviewers and certify that the thesis is suitable for defense. The seminar on the student’s thesis research will immediately precede the closed meeting between the student and the appointed examining committee.

**Thesis Preparation.** The doctoral thesis is required to be submitted to the Graduate School electronically. The Graduate School has very specific requirements for the preparation of this copy, and their regulations should be consulted (consult the page “Thesis Formatting and Submission” on the Graduate School’s website: [http://www.grad.umn.edu/current-students-forms/formsdoctoral](http://www.grad.umn.edu/current-students-forms/formsdoctoral)). One bound copy is required for the major advisor. Additional copies may be prepared according to the student's wishes. The graduate student shall bear the expense of preparation of the thesis. Neither the Department nor the training or research grants make any specific provision for defraying the cost of paper, typing, preparation of drawings or binding of the thesis. In some instances where diagrams are to be used in publications, the major advisor may have such diagrams prepared and charged to a personal research budget. In instances where immediate publication is thought necessary, the advisor shall indicate by letter to the Graduate School that such a publication is being submitted. This will become part of the student's record. An abstract is not considered a publication.

**Requirements for Graduation.** In addition to those requirements for graduation imposed by the Graduate Program and the Graduate School, students are required to obtain a complete the CoP Clearance Checklist and also ensure the following have occurred:

1. That all books or other materials checked out be returned to the appropriate library.
2. That all University keys be returned.
3. That the research bench and study desk be cleaned and ready for use by a new student.
4. That all research notebooks and materials be given to the research advisor.
5. That a forwarding address be given to the Department administration.

Satisfactory completion of these requirements must be demonstrated to the faculty advisor.
Degree Completion Deadlines. Students are expected to complete the requirements for the Ph.D. degree within five years. At the end of the respective period, all financial aid to the student will be discontinued and laboratory space, which has been allocated will be reduced unless the student's advisor requests an extension of the residency period.

DEPARTMENTAL, COLLEGIATE, AND UNIVERSITY POLICIES

Academic Standards. The academic performance of each graduate student will be reviewed by the Graduate Faculty at the end of each semester during the first two years. To remain in good academic standing students should meet the minimum GPA requirement of 3.0. Students who have filed a doctoral degree plan should maintain a 3.0 GPA for courses included on the degree plan. Students who have not yet filed a degree plan must maintain an overall GPA of 3.0. Students who fall below this minimum GPA requirement may be terminated from the program and their financial assistance discontinued.

Annual Review of Student Progress. In order to comply with graduate school policy, the graduate student evaluations will be conducted as follows.

1. The academic progress of first year students will be conducted by the DGS in consultation with the Academic Standing Committee after each semester and after the preliminary written exam.
2. The annual review of second year students will take place in conjunction with a student's preliminary oral exam.
3. In year three, the annual review will be held in conjunction with the research seminar the student presents during the summer. It is the responsibility of the student to coordinate to the extent possible with the members of the student’s final oral examining committee on the date of this presentation. The committee members will meet with the student after the presentation to discuss the student’s progress. A letter to the student, conveying the recommendations of the committee, will be prepared by the student's advisor, in consultation with the committee members. A copy of the evaluation letter will be forwarded to the director of graduate studies and placed in the student's file.
4. After year three, the following process will be followed:
   a. Each student is responsible for convening an annual meeting of the medicinal chemistry graduate faculty members of their final oral examining committee.
   b. The committee will meet with the student with the purpose of evaluating the student’s progress toward his or her degree. It is expected that each student will give a 15-30 minute presentation of his or her project and progress.
   c. A letter to the student, conveying the recommendations of the committee, will be prepared by the student's advisor, in consultation with the committee members.
   d. A copy of the evaluation letter will be forwarded to the director of graduate studies and placed in the student's file.
   e. All evaluations are to be completed by August 15 of each year. The DGS must approve any extension of this deadline.
   f. Students in the process of finishing their thesis, but who have not yet scheduled a date for their final thesis defense must be reviewed by August 15.

All students have the right to respond in writing to the evaluation and have the letter placed in their files.
**Selection of Advisor.** By the end of spring break (year one) at the latest, each student should have selected a major advisor and submitted a copy of the completed *Selection of Advisor Form* to the Director of Graduate Studies. The student will then begin residence in his/her advisor's laboratory. The following steps have been put in place to aid the incoming student in the important process of selecting an advisor:

1. During the fall semester, incoming students will be afforded opportunities for students to discuss research with graduate faculty.

2. *Laboratory Rotations.* Lab rotations present excellent opportunities to consider and discuss potential research projects with faculty members. Each first-year graduate student must rotate through at least three different laboratories. Students are expected to work in lab a minimum of 10 hours per week. The Director of Graduate Studies determines the lab rotation assignments based on student interests and the availability of space. Each rotation will be about 6 weeks in length. When students are not attending classes or carrying out TA responsibilities they will be participating in research activities in these labs. Faculty submit written evaluations to the Director of Graduate Studies. All lab rotations are "hands-on" experiences, so expect to be involved!

3. *Individual Faculty Meetings.* Once students have narrowed their choices of potential advisors, they should meet individually with these faculty to discuss potential research projects.

**Responsibilities.** Please see the Graduate School’s policy on “**Mutual Responsibilities in Graduate Education at the University of Minnesota**” for principles on what students should expect from their programs and what programs should expect from their students.

**Opportunities for Student Involvement.** There are many opportunities for students to develop professionally through active involvement in departmental committees and student organizations, such as:

1. *MIKI Organization Committee.* This is a student-led committee responsible for organizing the MIKI meeting at Minnesota every four years.

2. *Council of Graduate Students (COGS).* COGS is the student organization that represents, advocates for, informs, facilitates communications among, and supports graduate students. At the being of the Fall semester, graduate students elect one representative and one alternate representative for terms of one year. The responsibilities of the representative are to attend all COGS meetings and participate in representing medicinal chemistry graduate students in issues that come before COGS. All students in good standing are eligible to serve as a COGS representative. More information about COGS can be found at [www.cogs.umn.edu](http://www.cogs.umn.edu).

3. *Graduate and Professional Student Assembly (GAPSA).* The primary function of GAPSA is to ensure that the University works in the interests of excellence in the graduate and professional experience. More information about GAPSA can be found at the [gapsa directory](http://gapsa.umn.edu).
Standards of Ethical Conduct. Integrity is the foundation upon which the structure of the scientific enterprise is maintained. Science can fulfill its mission of advancement of knowledge and service to society only if scientists conduct themselves ethically and with mutual respect. Thus, the singular dependence of science on the trustworthiness of its practitioners necessitates that no act of dishonesty be considered minor. In an academic institution, it is the responsibility of the faculty to serve as role models by exhibiting and enforcing the highest standards of ethical conduct.

Although instances of dishonesty and unethical behavior are rare, it is important that students be aware that such acts will be considered grounds for dismissal from the program. Because the act of plagiarism is a particularly egregious affront to scientific integrity, it warrants special attention. Plagiarism is defined as the stealing and passing off as one's own the ideas or words of another. Plagiarism may occur in seminar abstracts, research proposals, term papers, theses and similar documents. It includes not only the copying of another's writing, word for word, without the use of quotation marks and without giving an appropriate citation, but also the theft of another's ideas by paraphrasing their words without citing a reference. Plagiarism is as serious an act of dishonesty as falsifying experimental data or cheating on an exam. The faculty of the Department of Medicinal Chemistry will recommend the dismissal from the graduate program of any student found guilty of plagiarism or other ethical misconduct.

The misuse of computers also represents a potential issue in this age of the Internet and information technology. The computers and computer systems of the Department, College and University are provided to support the research and scholarship of the faculty, staff, and students. Unauthorized usage of computers, computer systems, software, etc. will not be tolerated. In particular, the posting or accessing of illicit or offensive material on Department, College or University computers will be considered grounds for dismissal. As part of the overall graduate student education and training process, students will be provided responsible conduct of research education and training. All incoming students will be required to attend the short course that is offered by the Center for Bioethics under the auspices of the Office of the Vice President for Research and Dean of the Graduate School. In addition, all students are required to participate in the periodic supplemental training offered by the Department.

Departmental Seminars and Special Lectures. Each semester a significant number of scientists from other academic institutions and from industry are invited to the department to give either a presentation in our weekly seminar program or a special lecture. Attendance and participation in departmental seminars and special lectures is required.

Laboratory Security and Safety. It is the responsibility of the graduate student not only to take proper care of the laboratory equipment and instrumentation but also to assist in their protection from accidental damage and theft. In particular, graduate students working during evenings or weekends should be careful to see that:

1. All gas, water, and electrical equipment (except that continuously operating) is shut off. If overnight equipment is to be in operation, suitable precautions should be taken to insure proper operation and safety of the equipment and the surrounding environment. Custodial personnel should also be notified of such operation.
2. Office and laboratory doors are closed and locked. Failure to observe these precautions may result in cancellation of the privilege of use of the facilities outside of regular hours. It also is the responsibility of each graduate student to be familiar with safe laboratory practices and proper chemical waste management procedures. All students are required to take the online training in laboratory safety and chemical waste management that is offered by the University’s Department of Environmental Health & Safety during their first semester of residency (http://www.dehs.umn.edu/training_new_empl.htm). The three tutorials to be taken are: Introduction to Research Safety, Chemical Safety, and Chemical Waste Management. In addition all students are required to attend and participate in any Departmental refresher training courses.

Ordering of Supplies, Equipment and Animals. All orders for supplies, equipment or animals must be approved by the student's major advisor who will designate the correct budget and authorize the purchase to the purchasing agent. All requisitions asking for the departmental funds must be signed by the Department Head or his/her designated alternate.

Equipment and Utility Repairs. For servicing of the facility’s utilities (water, gas, electricity, compressed air, plumbing, etc.), one of the departmental secretaries should be contacted. This individual will contact Facilities Management. If college or department instrumentation requires repair, the student should contact their advisor, who will inform the Department Head or Associate Dean for Research about the needed repairs. Graduate students will be assigned specific responsibilities for maintenance and upkeep of departmental instrumentation.

Medicinal Chemistry Travel Policy. Participation in scientific meetings and conferences is an important way for students to join and be recognized in the greater research enterprise. To help offset the cost of student travel and supplement funds available to research advisors, the Department provides up to $1500 to each student to defer costs of meeting or workshop attendance. Requests for funding must be made to the Director of Graduate Studies prior to travel and include the name of the student and advisor, the reason for travel, a budget outlining expected expenses, the title and abstract of any presentation to be made, and a list of other possible sources of funding. An example approval application can be obtained from the departmental office. Priority will be given to students presenting research. Requests for funds exceeding the $1500 career allocation will not be honored. In the event that there are more requests than funds the DGS will convene a committee to prioritize the funding of requests. Students will be required to attest that they will not be receiving monies from other sources for the same expenses, and to provide documentation for reimbursement consistent with University guidelines.

Medical Scientist Training Program-MD/PhD Program. Medicinal Chemistry participates in the Medical Scientist Training (MSTP) program in the design and completion of the MD/PhD degree. The faculty accept students for summer rotations as part of the PhD advisor selection process within the MSTP program. Students that are interested in selecting a preceptor in medicinal chemistry should discuss potential projects and the availability of long term funding to complete the PhD degree in specific laboratories. The process is described in the MSTP Program Handbook* for the selection of preceptors and the completion of lab rotations. Students that select medicinal chemistry as their PhD program must be accepted through the standard admissions process prior to entering the graduate program. Once admitted, all programmatic requirements must be met to qualify for PhD candidacy as described in the graduate student policies and procedures. Students that have completed the MSTP-sponsored rotations with
medicinal chemistry faculty may apply this to fulfill the laboratory rotation course requirement of the medicinal chemistry graduate program. Students in the MSTP program are also expected to be supported by their advisor in the first year of graduate studies in the program and should discuss funding options and space availability prior to selecting a particular laboratory. Students that have not identified a specific medicinal chemistry faculty member for their advisor will complete the normal advisor selection process during their first year in the program.

*Mhttps://www.med.umn.edu/sites/med.umn.edu/files/univ_of_minnesota_mstp_policies_and_procedures_2016-17_06-01-17.pdf*

**MISCELLANEOUS**

**Email Communication.** The University of Minnesota student email account is the University’s and Department’s official method of communication. This is to ensure compliance with the strict security requirements of federal HIPAA laws and regulations. Students are responsible for all communications sent to their student email account. [http://policy.umn.edu/education/email](http://policy.umn.edu/education/email)

**Copying Equipment.** Since departmental or research budgets are charged for all work done on Departmental and College copiers, departmental or advisor approval is necessary prior to the use of such copying equipment. Any use of duplicating equipment should be for scientific work or teaching necessity. The departmental copiers in 8-108WDH, 450 717DE 2-156 CCRB are not to be used for personal business. Graduate students are not allowed to charge duplicating costs on a departmental budget unless approval has been given by the Department Head or his/her designated alternate.

**MIKI Meeting.** Since 1963, the Departments of Medicinal Chemistry of the Universities of Minnesota, Iowa, Kansas, and Illinois-Chicago have conducted an annual one and one-half day Medicinal Chemistry Meeting-in-Miniature (MIKI Meeting). The scientific portion of the meeting consists of oral and poster presentations by graduate students and a keynote lecture by an outstanding research scientist who is selected by the graduate students of the host department. Students are expected to attend and to present their research work at the annual MIKI meetings. They are also expected to participate in the organization of the meeting when it is hosted by the University of Minnesota.

**Vacations and Breaks.** Students receiving teaching assistantships should make vacation arrangements with the Director of Graduate Studies. In this regard, the break between fall and spring semester and spring break are not vacation days, since students receiving TA support are being paid during these times. Students receiving research assistantships should make vacation arrangements with their respective research directors. No provision for vacations is inherent in the various grants, but institutional policy allows some time off with the details in the hands of the respective research director or major advisor. A leave of absence without stipend will be given to any student who, for health or other reasons, is absent for more than one month.
APPENDIX

Commonly Used Forms. Electronic copies of forms, directions on how to obtain forms, and filing deadlines for forms can be found on the Graduate School website either at http://www.grad.umn.edu/students/forms/doct oral/index.html or for Master’s degree forms http://www.grad.umn.edu/students/forms/masters/index.html. Here are some of the most common forms:

1. **Graduate Degree Plan Form** used by masters and doctoral students entering before Fall 2018. It is considered to be a contract between the student, graduate program, and the Graduate School.
   On this form the student will indicate the coursework being used to meet course requirements, as well as the Graduate School’s minimum credit requirements, including transfer coursework. Master’s students will list the names of faculty that will be serving on their final examining committee. Doctoral students will list the names of faculty that will be serving on the preliminary oral examining committee. The completed form must be signed by the advisor, DGS, College and a copy filed in the Med Chem office prior to submission to the Graduate School. http://policy.umn.edu/forms/otr/otr198.pdf

2. **Preliminary Oral Exam Scheduling form** used to schedule a preliminary oral examination date as soon as a date has been set with your committee. http://www.grad.umn.edu/students/prelimschedule/index.html

3. **Graduate Planning & Audit System (GPAS) planner** the system adopted by the Graduate School for use by masters and doctoral students entering in or after Fall 2018. This system allows graduate students to plan future coursework and view student degree progress and is mandated for use in order to progress to preliminary written and oral exams and doctoral or masters candidacy. More information can be found at https://onestop.umn.edu/academics/gpas

4. **Preliminary Oral Exam form** completed and signed by the committee upon completion of the preliminary oral examination. This form is mailed to the chair of the committee as designated on the Graduate Degree Program form or will be available for pick-up by the student at the Graduate School if there is less than 2 weeks time between when the exam is scheduled and the date of the exam.

5. **Final Oral Exam Scheduling form** used to schedule a final oral examination date as soon as a date has been set with your committee. http://www_grad.umn.edu/sites/grad.umn.edu/files/final%20quickstart%20guide.pdf

6. **Thesis Reviewers Report form** to be signed by final oral examination committee members designated as reviewers to certify that the thesis is suitable for defense. This can be found in the student’s graduation packet.

7. **Final Oral Exam form** completed and signed by the committee upon completion of the final oral examination. This form is mailed to the chair of the committee as designated on the Thesis Proposal form or may require the student to pick it up from the GSSP Office based on timing.