Organic Chemistry Division Graduate Student Requirements: Qualifying Procedures and Earning a Ph.D.

It is the responsibility of the student to know, understand, and adhere to these Division requirements.

1. Objectives and Philosophy

Welcome to the University of Florida Organic Division! We are excited that you have decided to join us and have high hopes and grand expectations for your Ph.D. studies. Our goal is to provide you with the necessary training to become an independent scientist and our program is designed to give you a well-rounded education. In addition to developing a cutting-edge research project into a Ph.D. thesis, we have confidence that you will:

- Acquire a high level of expertise and creativity in the area of organic chemistry.
- Gain expertise in teaching and mentoring students in the classroom and laboratory settings.
- Develop excellent oral and written communication skills.

2. Qualifying Procedures

2.1. Getting Started

2.1.1. *Overview*

The path to a Ph.D. degree in the Organic Division involves several steps. During the first one and a half to two years, students complete their coursework (usually two or three courses each semester). These courses provide the theoretical underpinnings for a successful research career. All students qualifying in the Organic Division also participate in the Organic Chemistry Seminar series. Students will join a research group by mid-October (if admitted in the fall) or the end of the spring semester (if admitted in the spring) and strive to become active in research as soon as possible. **For fall admits, the written cumulative exams will be taken no later than a student's second semester (regardless of the anticipated terminal academic degree), and the oral qualifying exam must be taken by the end of the 7th semester of graduate studies.** After passing the written and oral exams, the student is admitted to (has qualified for) the Ph.D. program. After successfully completing a research project, the student writes a dissertation and presents an oral defense to complete the requirements for the Ph.D. degree. Students typically need four to five years to complete these requirements.

2.1.2. *Organic Division Placement Examination*

All incoming graduate students with an interest in organic chemistry must take the "placement examination" that is offered the week before classes begin each fall semester. The exam is strictly diagnostic, and will serve to illuminate the student's strengths and weaknesses as they relate to the fundamental/core concepts in organic chemistry including (but not limited to) stereochemistry, conformation, organic reactions and mechanisms, photochemistry, etc. A student's performance on the exam will help to guide his/her approach to CHM 5224 (Basic Principles for Organic Chemistry), a required core course (see Section 2.2), and/or eligibility to take CHM 6225 his/her first semester (for students admitted in the spring term).

2.1.3. *Selection of a Research Advisor and Ph.D. Supervisory Committee*

Students should consult Sections 3.3 and 3.4 of the UF Graduate Student Handbook for general information concerning Ph.D. mentor and supervisory committee selection.

2.2. Course Requirements

2.2.1. *Objectives and Philosophy*

All graduate students qualifying for a Ph.D. in organic chemistry must satisfy the minimum course requirement by taking at least 6 graduate level courses.

2.2.2. *Core Organic Chemistry Courses (required of all Organic Ph.D. candidates)*

Course Number	Course Title	Credits
CHM 5224	Basic Principles for Organic Chemistry	3
CHM 6225	Advanced Principles of Organic Chemistry	4
CHM 6226	Advanced Synthetic Organic Chemistry	3

2.2.3. *Electives*

In addition to the above required organic chemistry courses, each student must complete three elective courses. Course selection is generally guided by the student's interests and Ph.D. advisor's input. While ordinarily electives will comprise courses from outside of organic chemistry, typical exceptions include:

Course Number	Course Title	Credits
CHM 5235	Organic Spectroscopy	3
CHM 5275	The Organic Chemistry of Polymers	2
CHM 5511*	Physical Chemistry of Polymers	2
CHM 6227	Topics in Synthetic Organic Chemistry	2
CHM 6251*	Organometallic Compounds	3
CHM 6271*	The Chemistry of High Polymers	2

* Note: These courses are not taught every year. Check the current course listings at http://www.registrar.ufl.edu/soc/.

Electives may come from other Departments/Colleges on campus. Writing in the Sciences (CHM 6180), while strongly encouraged, does not count toward the elective requirement.

2.2.4. *Typical Course Schedules for Students Entering in Fall Semester (August)*

	Fall Year 1[a]	**Spring Year 1**	**Fall Year 2**
Standard organic track	CHM 5224, CHM 5235, elective	CHM 6225, CHM 6226	elective[b]
Polymer track	CHM 5224, CHM 5275	CHM 6225, CHM 6226	CHM 5511, CHM 5235

[a] Students are strongly encouraged to take three courses during their first semester. Exceptions sometimes include students who are required to take an intensive (four credit) English course. [b] Students, upon consultation with their research advisor, should consider taking this elective in Spring Year 1.

2.2.5. *Typical Course Schedules for Students Entering in Spring Semester (January)*

		Spring Year 1	**Fall Year 1**	**Spring Year 2**
Standard organic track[a,b]	*Option 1*	CHM 6225, elective	CHM 5224, CHM 5235	CHM 6226, elective
	Option 2	elective, elective	CHM 5224, CHM 5235	CHM 6225, CHM 6226
Polymer track[a]		CHM 6225, elective	CHM 5224, CHM 5275	CHM 6226, CHM 5511

[a] Students are strongly encouraged to take three courses whenever possible. Exceptions sometimes include students who are required to take an intensive (four credit) English course. [b] The best option will be determined, in part, on the student's performance on a "placement examination" (Section 2.1.2) administered upon arrival to UF.

2.2.6. *Transferring Credits of a Master's Degree from another Institution*

Students should consult Section 4.3 of the UF Graduate Student Handbook for guidelines concerning transferring course semester credits of a previously earned master's degree to the doctoral program.

2.3. Written Qualifying Examination (Cumulative Exams)

2.3.1. *Objectives and Philosophy*

The main goal of the UF Organic Division is to provide an education that takes professional students and transforms them into independent professional chemists. Cumulative exams are taken when the first semester of required coursework is complete and are designed to test the knowledge you have accumulated throughout your career. This is in contrast to coursework exams that are designed to test a specific set of assigned materials. You should expect to be tested on the fundamental knowledge that you have learned in your courses and to apply the concepts you have learned to new and often unfamiliar material found in the recent chemical literature. These exams will assess how well your critical thinking and problem-solving skills are developing with regard to organic chemistry.

Continuous critical reading of the primary literature is vital to your success for cumes and in general!

Actively reading the literature on a daily basis will be excellent practice for encountering unfamiliar material, as you will when taking cumulative exams. You will also need to do this throughout your career, so starting these habits early will help you to excel. Additionally, this will help you to deepen your understanding of chemistry, increase your understanding at seminars, and help you to find subjects that you are personally interested in and may like to pursue in the future. You should also use this as a tool do identify areas where you are deficient and to explore them and teach yourself about them and constantly expand your knowledge base.

2.3.2. *Cume Content*

The organic faculty member giving the cume will select questions from two sources, the first source being the current literature (as assigned by the faculty member responsible for the cume) and the second source being the core first year organic curriculum (e.g., CHM 5224, CHM 6225, and CHM 6226) and fundamental organic chemistry concepts.

Students will be provided with a list of broad topics as a guide to help study the literature and prepare for each upcoming cume. *We do not expect that you will memorize all the information in the materials provided*. This is in fact discouraged as you will not be expected to recite obscure facts. It is instead suggested that you critically read and understand the material.

Here is a list of broad topics:

1. Kinetics	7. Reactive Intermediates	13. Organometallics & Metal-Mediated Reactions
2. Thermodynamics	8. Total Synthesis	14. Structure and Bonding
3. Stereochemistry	9. Organic Materials	15. Heterocyclic Chemistry
4. Pericyclic Reactions	10. Polymerization	16. Free Radicals
5. Photochemistry	11. Bio-organic	17. Synthetic Methods
6. Reaction Mechanisms and arrow pushing	12. Spectroscopy	

2.3.3. *Regulations and Timing*

1. All graduate students qualifying in the Organic Division, regardless of terminal degree expectations (non-thesis M.S., thesis M.S., Ph.D.), must take the cumulative exams.

2. At the beginning of the fall semester, students will receive a schedule by email indicating the faculty responsible for the cumulative exams in the coming months.

3. Exams are on the first Wednesday of the month from 7:30–9:30 PM *except*: a) September, when the exam will be given on the second Wednesday; b) if the first Wednesday falls on a university holiday (including Spring Break), in which case the exam will be given the following Wednesday. Exams are administered in 340 Sisler Hall.

4. Exams are given in September, October, November, December (fall semester) and February, March, April, and May (spring semester).

5. Grades of Pass, Half-Pass and Fail will be recommended to the cume committee, who will make final grade assignments.

6. A total of 4 passes out of a consecutive 8 exams is required to pass the written qualifying portion of the Ph.D. degree in organic chemistry. Students with 3.5 cume passes must complete a Master's degree, typically by the end of the subsequent semester, but may then petition the Division for readmission to the UF Chemistry Ph.D. program (upon the recommendation of their advisor and M.S. committee). Students with fewer than 3.5 cume passes will receive a terminal Master's degree.

7. A total of 2 passes out of a consecutive 8 exams is required to pass the written qualifying portion of the M.S. degree (thesis or non-thesis) in organic chemistry. Students who do not meet the cume requirement must petition the Division for exemption from the policy. In these rare cases, an additional written requirement may be imposed. *Note:* Terminal M.S. students, in principle, can stop taking cumes after meeting their two cume pass requirement; however, cumes may only be taken by students within their first four semesters. Prematurely terminating cumes is therefore not recommended and may preclude students from later entry to the Ph.D. track.

8. Students admitted in the fall must begin the consecutive 8 cumes no later than February of their 1st year. Spring admits must begin no later than September of their 1st year, although starting sooner is encouraged. Some students will enter our program with a master's degree or some previous graduate level coursework. If the student is well-prepared (regardless of admission semester) (s)he can start right away upon consultation with their research director. The student must also inform the graduate coordinator so that it may be recorded in their file.

9. A student is eligible to take one free <u>organic</u> cume **before** officially beginning the cume sequence to "sample" the cume system. If passed (half or full pass), the grade will count toward the total of 4 passes needed to complete the written qualifying exams. If failed, no penalty is applied. For fall admits, the sample cume must be taken in the fall of the first year; the next cume, taken no later than February of the first year (in accordance with Regulation 8), initiates the formal cume sequence of 8 consecutive exams. For spring admits, the sample cume must be taken in the spring of the first year; the next cume, taken no later than September of the first year (in accordance with Regulation 8), initiates the formal cume sequence of 8 consecutive exams.

10. <u>One</u> cume can be taken from a division outside of organic as one of the 8 attempts. This "out-of-division" cume can be taken before or during the formal 8 consecutive cumulative exam sequence but, in and of itself, will not initiate the sequence. Regardless of the student's result, the "out-of-division" cume will count as one of the 8 possible cumulative exam attempts. If a student admitted in the fall takes the "out-of-division" cume and an organic cume *during the same month* <u>OR</u> the "out-of-division" cume in a month that no organic cume is offered (e.g., January), the student's cume sequence will end one month earlier. This rule will be similarly applied to students admitted in the spring and those who initiate their cume sequence early. Students must obtain approval for taking an "out-of-division" cume from both the Organic Division Head and the faculty member administering the cume in the other division.

11. Each exam will include questions from literature assigned by the professor responsible for the examination and related to the broad topic announced two weeks prior to the examination date.

12. A list of examiners and their exam months will be given to the students at the beginning of the school year (see above).

13. Students will use a code, instead of their name on the top of the cume. This code should in no way be traceable to the student (i.e., it should not be a social security number, student ID, birth date, etc.). The students will put their name and the code into a sealed envelope, give it to the faculty member and it should be turned into the cume committee later **unopened**.

14. Any new or further information from individual faculty about any upcoming cumes will be e-mailed to the organic students as it becomes available. It will also be posted outside of 429 Sisler Hall.

15. Results will be distributed by the Organic Division's Administrative Assistant.

2.4. Seminars

2.4.1. *Objectives and Philosophy*

Organic seminars come in two flavors, those offered by graduate students and those given by external (invited) speakers. The former give graduate students the opportunity to practice public speaking, to learn their research area in-depth, and to present research results. The latter expose students to the exciting science that is going on elsewhere in the world.

2.4.2. *Regulations and Timing*

1. Organic seminars are held on Thursdays from 4:00–5:00 PM in either the Sheridan Auditorium (JHH221) or Leigh Hall Room 207 during the fall and spring semesters and will be given by graduate students or a visiting (invited) speaker. On weeks when there is a visiting speaker, the student seminars, if necessary to be held, will be held on an alternate day of the week. This alternate day is typically Tuesday from 4:00–5:00 PM. Note that the location is subject to change pending room availability.

2. Seminar attendance is *mandatory* for all graduate students qualifying in the Organic Division but attendance will be taken for and grades administered to only students in years 2–4.

3. Registration for CHM 6390 is required each fall/spring semester for students in years 2–4 (so, a student's third through eighth fall/spring semester), regardless of whether the student's enrollment began in the fall or spring semester. Each semester students will attend both student and external seminars. Students will present one seminar each year, with the first emphasizing the literature surrounding his/her Ph.D. project and preliminary experimental results. The final two seminars will focus mostly on original research results. Complete details can be found in the CHM 6390 syllabus.

2.4.3. *Grading and Exceptions*

2.4.3.1. *CHM 6390 Course Grading*. In a semester a student gives a seminar, a letter grade will be given for CHM 6390 on the basis of attendance *and* presentation *and* proper/timely delivery of talk title to the course instructor. Presentation grades will be based on quality of verbal delivery and of computer-generated presentation aids (*e.g.*, slides, graphics, etc.), clarity and comprehensibility, and timing. The grade can be attenuated by talk title submission and attendance. In a semester a student does not give a seminar, a letter grade will be given for CHM 6390 based solely on attendance. See the CHM 6390 course syllabus for details.

2.4.3.2. *Exceptions*. a) If a student cannot speak for a good reason (e.g., away on official business), the student must notify the seminar course instructor immediately upon learning of the seminar schedule. If the reason for nonattendance is an emergency, then the student should notify the course instructor in writing by e-mail as soon as possible. If the timing allows, then a new date should be set that is mutually agreeable. The student concerned is responsible for arranging this new date by communicating with his or her own supervisor and finding another student (from his or her own or another group) who is willing to switch with him or her. b) All non-conflict requests for presentation date change must be accompanied by a supporting statement signed by the supervisors of each of the students concerned in the switching. c) Two additional exceptions to the seminar attendance policy include (i) a teaching assignment with a written statement sent to the course instructor not later than the first Wednesday after the start of the semester and (ii) a medical emergency (or the equivalent) that has been certified by the graduate coordinator or the student's Ph.D. advisor. d) Students in their final semester of graduate study are not required to register for CHM 6390 but should still attend seminars. If they choose to register they *must* attend.

2.4.4. *Presentation Format and Approach*

2.4.4.1. *General.* Slides should be prepared using PowerPoint or similar presentation software. The materials on the slides should be carefully formatted for clarity, with text being sufficiently large to be read by the audience (> 16 pt font), and chemical structures and schemes prepared using ChemDraw. Avoid presenting tables of data and/or complicated chemical schemes on individual slides (it is best not to copy/paste schemes and graphics from published papers, as often this results in blurry images when projected onto a large screen. Note that many journals now allow users to download charts, schemes, and figures into PowerPoint directly from the journal website.) All talks should be carefully prepared and practiced to be 25 ± 2 min in length; 3 additional min will be allotted for discussion. A typical 25 min talk will

contain 18–21 slides. It is important to practice your presentation several times (preferably to your research group and/or an audience of your peers), as this will help you prepare the delivery and to get the timing correct.

2.4.4.2. *Talk content*. Students should consult the CHM 6390 course syllabus for details on talk content.

2.5. Oral Qualifying Examination: Research Progress Report and Original Research Proposal

2.5.1. *Objectives and Philosophy*

The oral qualifying examination must be taken no later than the 7th semester of residence (i.e., the fall semester of the third year for a student who began studies in August), but may be taken at any earlier time provided that the student (a) is in good academic standing (GPA > 3.0) and (b) has successfully completed the written qualifying examinations (cumes). In cases where the oral must be scheduled late, *students must petition the Division (with a supporting letter from their research advisor) for an extension; denial of the petition means that they will be eligible only for an M.S. degree.*

The qualifying examination will consist of two parts: (a) an original research proposal and (b) an up-to-date research progress report.

The objectives of the oral qualifying examination include:

1. To assess the student's progress on his/her independent research project.
2. To evaluate the student's ability to prepare and defend an independent research proposal in the area of organic chemistry.
3. To evaluate a student's understanding of the fundamental principles of organic chemistry, e.g. reaction mechanisms, common synthetic methods, theoretical principles of structure and bonding, etc.
4. To assess a student's ability to document their experimental (or theoretical) results in a manner consistent with publication in a peer-reviewed organic chemistry journal (e.g. *J. Org. Chem.* or *Org. Lett.*).
5. To assess the student's ability to think creatively "on their feet", answer questions, and defend their point of view.

2.5.2. *Eligibility and Scheduling*

Once a student has passed the written qualifying examinations and remains in good academic standing, he/she is eligible and encouraged to start planning for the oral qualifying exam. Typically a discussion with the student's Ph.D. mentor is sufficient to identify a time frame for when the event should occur, and again this should be no later than the 7th semester of residence (i.e., the fall semester of the third year for a student who began studies in August). In most cases the specific date will first vary depending on the student's research progress, Ph.D. mentor's travel schedule, and acceptance of the candidate's proposed research topic (see Section 2.5.3). Again, in cases where the oral must be scheduled late, *students must petition the Division (with a supporting letter from their research advisor) for an extension; denial of the petition means that they will be eligible only for an M.S. degree.*

Once a candidate's proposed research topic is approved, he/she should identify a date and time where all members of the supervisory committee can be present. The candidate should allow *two hours* for the examination and is responsible for booking the examination room (e.g. Sisler 340) and a projector/computer. There are several ways to approach the committee members to decide on a date/time, and here are two that are generally appreciated:

1. Visit the committee member *directly* to obtain his/her schedule for no more than a two-week period surrounding the planned date for the exam.
2. Use a scheduling website (e.g. www.when2meet.com) in conjunction with e-mail contact. In this case the student would propose a two-week period and reasonable time slots (e.g. starting no earlier than 9 a.m. and ending no later than 5 p.m.).

The student should not send an e-mail to a committee member simply asking them to relay their daily schedules for a particular time period!

2.5.3. *Preliminary Abstract*

The topic of the research proposal portion of the oral qualifying exam must be approved **at least** six weeks before the oral exam (see Section 2.5.4 for how to choose a topic). To facilitate this process, the student will prepare an approximately one-page abstract (1–3 paragraphs of text and 1–2 guiding figures) with selected major references to describe the proposal. An example is provided as **Appendix A** (on the Organic Division website).
Approval must come from the student's Ph.D. research supervisor **and** one member of the Organic Division serving on the student's Supervisory Committee; usually this is done by e-mail correspondence. The primary basis for approval of the oral exam topic will be *originality*. Originality is defined here in two ways: First, the proposed research should represent a *clear departure* from both the student's ongoing dissertation research and the research ongoing (or historically performed) in the laboratory of the student's supervisor. The research supervisor's primary role is to ascertain that the topic is original in this sense. Second, the proposed research should be original with respect to the scientific literature, just as would be expected if it were submitted to an agency for funding (see Section 2.5.4 for more details). Both approvers are free to weigh in on this aspect at the time of submission. In the event the topic is unsuitable for further development, the student will be required to submit a new topic for consideration. *Students should realize that the originality of the proposal will be further evaluated in the final document/oral qualifying examination.*

2.5.4. *Choosing a Research Proposal Topic and Getting Help*

2.5.4.1. Why do I have to do this? Recognition and development of original and meaningful research problems is an important aspect of the work of a Ph.D. scientist. This requirement is intended to help the student develop his/her skills in selecting a research problem and writing a research proposal. Students who have naturally been giving this some thought through their ongoing reading of the scientific literature find the task more tractable.

2.5.4.2. Evaluating a good proposal topic. The NSF (www.nsf.gov) and NIH (www.nih.gov) proposal guidelines are one place to start to understand how original research is defined and evaluated. Typically, reviewers of proposals are asked to identify: How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed science? You might consider these questions and the following proposal evaluation criteria as you choose your topic and start developing your document:

1. *Scientific Merit and Creativity:* Is the proposal worth doing, does it lead to new and nontrivial results, does it overlap excessively with work under way at the University of Florida? Does the proposal contain a testable hypothesis (desirable) or does its success depend on a trial and error approach (undesirable)? Is the proposed work "derivative" with the results largely predictable from the available scientific literature?

2. *Practicality:* Does the proposal constitute a research problem (desirable) or a research program (undesirable); would an advanced student or postdoctoral fellow be expected to make substantial progress in a reasonable amount of time?

3. *Technical Competence:* Is it likely to work? Are theoretical arguments sound, will the experiments lead to conclusive and observable results, has the student overlooked reasonable alternatives, will synthetic steps work, are the analogies appropriate?

2.5.4.3. Choosing a topic. The Organic Division consensus is that the most successful proposal topics are those firmly based in the area broadly defined as molecular organic chemistry. Attractive topical areas include: Organic or appropriate enzyme mechanistic studies, synthetic methodology development, photochemical mechanisms or outcomes, total synthesis, novel polymerization methods or mechanisms, etc. The Division discourages proposals that are too heavily focused on the design of complex systems or too applied (e.g. relying on the engineering of devices). An example of a successful proposal is provided as **Appendix B** (on the Organic Division website). *Remember, once you have selected a topic, it needs to be approved (see Section 2.5.3).*

2.5.4.4. Getting help. The student is free to consult with anyone, including the Supervisory Committee, in developing the proposal, but the Committee's role should be non-directive and the work should represent the student's own creative thinking.

2.5.5. *Preparing the Written Document*

2.5.5.1. Overview. One week before the oral examination on the approved topic, the student will distribute to the supervisory committee two thesis-style reports (these may be bound into one document that is divided into two parts).

Details for the preparation of the documents are provided below. Again, although candidates can solicit help with proofreading and formatting, it is imperative that the ideas contained within the documents have been generated with no more than minimal help and/or consultation with colleagues. **Important:** *If the student is the **primary author** of a manuscript that has been submitted for publication prior to the exam, this document may serve as a suitable substitute for the research progress report. In this case, however, the student should be prepared to present/discuss their current research (What progress has been made since submission of the publication(s)?) and future research plans.*

2.5.5.2. Plagiarism. Plagiarism is a violation of the UF Student Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) and one of the most common breaches of academic and scientific integrity. The U.S. National Science Foundation defines plagiarism as "the appropriation of another person's ideas, processes, results, or words without giving appropriate credit" (45 Code of Federal Regulations, Section 689.1). Plagiarism includes:

- Presenting ideas/thoughts of others as your own without giving credit to the inventors or co-inventors (e.g., claiming full credit for collaborative scientific ideas)
- Submitting a document which is in whole or in part copied from another source (including the internet or other public places) without giving credit to the original author/source. Plagiarism of this type includes word-for-word copying (where the copied text is neither in quotation marks nor cited) and "patchwork" plagiarism, where material from two or more authors/sources is combined (again, without citation) and presented as one's own literary work. Directly copying graphics or images from a publication, another student, or an advisor without proper attribution is also an example of plagiarism.
- Self-plagiarism: Creating a document with language or graphics duplicated from your publications (or other published sources where you are a co-author) without proper citation of the work.

Plagiarism is a serious offense and will result, at the minimum, in a student failing his/her Ph.D. oral qualifying examination.

2.5.5.3. General Document Formatting. Both the research progress report and original research proposal documents should adhere to the following formatting guidelines:

- Prepared using Times (or Times New Roman) 12 pt. font and double line spacing. Margins must be one inch and all pages should be numbered consecutively (except for the first page).
- The grammar, punctuation, and abbreviations should be consistent with those given in the *The ACS Style Guide: Effective Communication of Scientific Information* (3rd Edition, Oxford University Press).
- Figures, tables, schemes, etc. should be placed in the text near the point at which they are discussed.
- Chemical structures should be developed using ChemDraw, or equivalent chemical structure software (see instructions to authors in the first issue of *J. Org. Chem.* in any year for detailed formatting guidelines).
- Credit should be given for figures or tables that are taken or adapted from the work of others by proper citation. The direct copying and pasting of graphics from other sources is not allowed.
- The first page of each document should be a title page that includes:
    - The title of the document, written as either **Research Progress Report: [Specific Title]** or **Original Research Proposal: [Specific Title]**
    - The student's name
    - The following information: "Oral Qualifying Examination, University of Florida, Department of Chemistry, Division of Organic Chemistry"
    - A listing of the student's committee members, written as:
        - **Dissertation Committee:** Prof. Ron Castellano (advisor), Prof. Kirk Schanze, Prof. Aaron Aponick, Prof. Valeria Kleiman, Prof. Jennifer Andrew
    - The date and time of the oral examination (and room number, if known)
- The second page should be a 200–300 word abstract.
- The main body of each document (excluding title page, abstract page, experimental section (for the Research Progress Report), and references) should be **10–15 pages** in length. **Documents exceeding 15 pages are strongly discouraged.** *Remember, for scholarship/fellowship/grant proposals submitted to funding agencies page limits are strictly enforced!*
- The final section of each document should be the literature cited. Format for journal references:
    - *Research Progress Report:* Aponick, A.; Castellano, R. K. *J. Am. Chem. Soc.* **2010**, *132*, xxx–xxx.
    - *Original Research Proposal:* Aponick, A.; Castellano, R. K. How to Format Journal References, *J. Am. Chem. Soc.* **2010**, *132*, xxx–xxx.

2.5.5.4. Research Progress Report: Additional Details. The research progress report is a document that briefly describes the student's progress to date on his/her research project. The style and format of the research report should be modeled after a typical paper in *J. Org. Chem.* The document should contain the following sections (following the Abstract page):

- Introduction (**2–3 pages**): Briefly describe the relevant background material.
- Results and Discussion (**7–10 pages**): Give the results obtained to date and discuss the results.
- Conclusions and Future Directions (**1–2 pages**): Draw conclusions and suggest future directions for the project.
- Experimental (length will vary): An experimental section must be included that is written in a style consistent with *J. Org. Chem.*, *Org. Lett.*, or *The ACS Style Guide*. All **novel** compounds must be properly reported in the Experimental Section and characterized in terms of identity (^{1}H NMR, ^{13}C NMR, and HRMS (or elemental analysis) data) and degree of purity (the student should have copies of clean ^{1}H NMR spectra available upon request). For known compounds synthesized by published methods as starting materials, appropriate discussion and citations should be included in the Results and Discussion Section and/or the General portion of the Experimental Section. Known compounds prepared by new or modified synthetic reactions should be accompanied by full experimental write-ups; moreover, the types of physical and spectroscopic data that were found to match *cited* literature data should be identified, and purity documentation should be available upon request.

Lastly, it is common for students at this stage of their graduate careers to have worked with others as they gain momentum on their Ph.D. projects. It is imperative that the candidate makes clear their individual contributions in the document and clearly identifies cases where collaboration has occurred.

2.5.5.5. Original Research Proposal: Additional Details. This document presents the original research proposal. The document should contain the following sections (following the Abstract page):

- **Specific Aims** (**1 page**): This section comes first in the body of the proposal because it is the cornerstone for everything else. It states what you want to do (the hypothesis or hypotheses to be tested), the impact that the proposed research will have on the field, why it is important (why the project has been chosen), and what will be accomplished by doing the work. The idea here is to state briefly and clearly (in one or two sentences) the significance of the research within the context of long-term goals and relevance to larger scientific issues. Within this context, it is important to then extend this in greater detail to pointed, specific aims (well-focused research objectives).

  The difference between a long-term goal and a specific aim is one of degree of achievement and accomplishments over the period of research. This proposal should describe a project that a graduate student or postdoc could complete within two years. The long-term goal sets out the larger perspective on the area of application of the research. The specific aim(s) set(s) out a portion of the big picture and establishes how it will fit within this larger perspective.

  Specific aims should identify the goals of the proposed research, the various experimentally approachable questions, and what general types of experiments that you will do. Although you need not and should not specifically state how your specific aims will help you to achieve your long-term goal(s), that connection should be made obvious by the clarity and logic with which you express yourself. The specific aims should be organized into an ordered list since large paragraphs do not provide an equivalent degree of organization. The specific aims should provide a succinct synopsis of what you intend to do, with milestones and decision points clearly enunciated.

- **Background and Significance** (**3–4 pages**): This section should be the introduction to the specifically proposed research, not an introduction to an entire discipline. While it should cite a sufficient number of references to demonstrate familiarity with the field of the proposed research, it should not be a disinterested literature review. Rather it should be a *critical evaluation* of the research area developed on your own that:
  - refers to appropriate published reviews that cover broad aspects of the research topic
  - includes recent, important, and relevant citations and findings
  - indentifies relevant controversies, if applicable
  - identifies gaps in current knowledge that must be filled

The final part (paragraph) of this section should state concisely the importance of the proposed research (its significance) and how accomplishing the specific aims will advance the needs of the field. That is, why is the work worth doing? How will the proposed work open up avenues to answer important fundamental or practical questions or help to solve societal problems?

- **Experimental Design and Methods** (**6–10 pages**): The section states precisely how the questions and hypotheses raised in each specific aim will be addressed and answered. The organization of this section should follow the order of specific aims presented previously. The experimental approach should be outlined clearly and in sufficient detail that the plan can be evaluated by the reviewers (faculty members). It is important in this section to:
    - provide precedent for new synthetic transformations by citing the closest analogy in the literature. Justify why the new reaction is *better* than existing methods
    - discuss control experiments
    - explain how the data are to be *collected*, *analyzed*, and *interpreted*
    - discuss potential *difficulties* and *limitations* (pitfalls) of the proposed procedures and *alternative approaches* to achieve the aims

  The candidate's goal with this section is to convince the reader that he/she can do the proposed work. This will most effectively be done using clear and succinct language.

2.5.6. *The Oral Examination*

2.5.6.1. One Week Before. Again, one week before the oral examination, the student will distribute to the supervisory committee the hard copy of the oral examination document. The candidate should also, at this time, ask one of the in-Division committee members (not the student's research advisor) to serve as "chair" of the oral examination event. Reminder e-mails should be sent during this week (complete with time and room number). Candidates should consult Section 3.5 of the UF Chemistry Graduate Student Handbook for what to do in the event that a committee member is unable to attend the oral examination. It should be noted that no substitutions may be made for the Ph.D. supervisor or the external member of the committee, and at least four committee members must be present at the exam. The Ph.D. advisor and student must be physically together for this event, but the remaining committee members can participate in real time using video or other acceptable forms of telecommunication (provided full committee consensus). In the case of a five person committee, a maximum of one member (other than the Ph.D. Advisor and out-of-Department member) can meet with the candidate separately if necessary (e.g., an irremediable scheduling conflict).

2.5.6.2. What to Bring. The candidate should be sure to have at their oral examination the following items:

- Computer, projector (if not already in the room), and laser pointer.
- One hard copy of the entire oral document (research progress report and research proposal).
- Paperwork provided by the Chemistry Graduate Affairs Office (e.g. Chemistry Department checklist, graduate course grades, and Admission to Candidacy form).

2.5.6.3. Rules and Format for Presentation. At the preliminary oral exam the student should be prepared to: (1) discuss his/her research progress and, although to a lesser extent, research plans; (2) present and defend the original research proposal. The examination is generally completed in ~ two hours. Questions during the oral exam can come at any time and will typically focus on the research progress report or the original proposal; however, the student should be prepared to answer any and all questions drawn from his/her area of expertise. Notes are not allowed.

Following a brief introductory statement given by the assigned chair of the oral examination event, the student will present his/her:

Research Progress Report: The candidate should present a 10 minute "executive summary" (approximately 10–12 scientific slides) of their research progress/project using PowerPoint. It is vital that a student understand that he/she is not giving a formal seminar (i.e. the presentation will likely be quite different, in content, breadth, and tone, from the research talk given to the Division (Section 2.4)) and can assume that the committee members have read the document. The presentation should quickly capture the key points of the work (as outlined in the research progress report abstract), and lengthy introductory material is discouraged. The presentation should be up-to-date with respect to the student's research progress and also touch briefly (~ 1 slide) on future research plans (this is particularly important for students who choose to use a submitted publication as the written research progress report). For general PowerPoint formatting guidelines, the student should refer to Section 2.4.4 of this document.

Original Research Proposal: At this point, some 30–45 minutes into the examination, the candidate will turn off the projector and head to the blackboard/whiteboard to present his/her original research proposal. Again, the student should assume that the committee has read the written document (i.e. an extensive introduction is not necessary) and immediately proceed to outline the proposed idea: what it is, why it is important, and why/how it will work. The presentation should quickly capture the abstract from the written proposal, and then work through the specific aims and research approach. Complex graphics can be abbreviated at the board or referred to in the written proposal.

2.5.7. *Outcomes*

A student can earn a pass, conditional pass, or fail for the oral qualifying examination on the basis of the written document and its presentation/defense. A pass means that the student has fulfilled the final requirement for Ph.D. candidacy and is eligible to continue working toward this degree. A conditional pass will require the student to revise the document and/or re-defend. In cases where a candidate's fundamentals have been deemed weak, the committee may require the student to shore up this aspect (e.g. by taking additional coursework). In all cases, the conditions for passing (and a new deadline if it applies) will be communicated to the student in writing by the student's research advisor, and both the Head of the Organic Division and the Director of Graduate Studies should be copied on the correspondence. The length of time allotted for revising and/or re-defending will vary, with the goal of making the time as short as is reasonable for the required work. The student may not advance to candidacy without a pass. If a student fails the oral qualifying examination, he/she may be eligible for a M.S. degree.

3. Ph.D. Dissertation and Final Defense

3.1. The Ph.D. Dissertation

Once a student has successfully completed the qualifying requirements, he/she will work closely with their Ph.D. advisor to mature a body of research to a point suitable for a Ph.D. dissertation. This written document will be prepared with the advisement of the Ph.D. advisor and in accordance with the strict guidelines of the UF Graduate School. The formatting guidelines, rules of submission, associated forms, etc. can be found on-line.

The Electronic Thesis and Dissertation (ETD) Lab offers tutorials and workshops each semester to assist students with the preparation of their documents.

The student must work closely with the UF Chemistry Graduate Affairs Office and the UF Graduate School to make sure that proper applications are made and all deadlines are reached for the desired graduation date (see, for example, the UF Graduate Critical Dates and Deadlines page).

Once the document is completed (on average, sometime in the 4^{th} or 5^{th} year), it will be presented to a general audience and then defended orally to the student's Ph.D. committee.

3.2. The Ph.D. Final Defense

3.2.1. *Scheduling the Defense*

Students should consult section 2.5.2 of the current document for how to schedule their defense day and time. Two hours should be allotted for the final defense.

3.2.2. *Two Weeks before the Defense*

Two weeks before the final defense, the student will distribute to the supervisory committee the hard copy of the dissertation. The document should be spiral bound through a professional copy service and complete. Unlike the oral qualifying exam, it is acceptable for the Ph.D. supervisor to "chair" the final defense event (so no additional provisions need to be made). Reminder e-mails should be sent to the committee members at appropriate times preceding the exam (complete with date, time, and room number). Typically, students also announce their defense (the presentation portion is public) by posting flyers (the dissertation title page) visibly within the Department. Candidates should consult Section 3.5 of the UF Chemistry Graduate Student Handbook for what to do in the event that a committee member is unable to attend the final defense. It should be noted that no substitutions may be made for the Ph.D. supervisor or the external member of the committee, and at least four committee members must be present at the exam. The Ph.D. advisor and student must be physically together for this event, but the remaining committee members can participate in real time

using video or other acceptable forms of telecommunication (provided full committee consensus). In the case of a five person committee, a maximum of one member (other than the Ph.D. Advisor and out-of-Department member) can meet with the candidate separately if necessary (e.g., an irremediable scheduling conflict).

3.2.3. *What to Bring*

The candidate should be sure to have at their final defense the following items:

- Computer, projector (if not already in the room), and laser pointer.
- One hard copy of the dissertation.
- Paperwork provided by the Chemistry Graduate Affairs Office (e.g. Final Defense form, signature pages, etc.).

3.2.4. *Rules and Format for Presentation*

Following a brief introductory statement given by the Ph.D. supervisor, the student will present a 30–45 minute seminar on their Ph.D. research using PowerPoint. This can be considered a formal seminar, but it should strike a thoughtful balance between introductory material (for attendees that may be new to the work) and scientific detail (remember, the committee has read the document). The best approach is for the student to, rather than focus on every result, hit the high points of the work performed and strive to put it into perspective. The final defense presentation is not a progress report, but rather an opportunity for the candidate to reflect on his/her achievements in the broader context of the field of organic chemistry. There may be many cases, for example, when a student might choose to present the results from selected chapters of the document (rather than touch on all of the work performed) because it makes for a more compelling and logical story.

The majority of the questions during the final defense will be saved for after the presentation. The floor is first opened to the public, after which time this group is dismissed. Questions will then come from the committee, and while these will focus largely on the dissertation document, they will also serve to have the student speak critically, holistically, and objectively about what he/she has achieved and why it is important. Specialized notes are not allowed.

3.2.5. *Outcomes*

A student can earn a pass, conditional pass, or fail for the final defense examination on the basis of the written document and its presentation/defense. A pass means that the student has fulfilled the final departmental requirement for the Ph.D. A conditional pass will require the student to revise the document and/or re-defend. The length of time allotted for revising and/or re-defending will vary, with the goal of making the time as short as is reasonable for the required work. The student may not receive a Ph.D. without a pass. If a student fails the final oral exam, he/she may be eligible for a M.S. degree.

4. M.S. Degree: Types, Dissertation, and Defense

4.1. A Master's Degree Based on Coursework: Non-thesis Master's

Once a student has successfully completed the coursework requirements, he/she is eligible to complete a coursework master's degree upon mutual consent of the student and the student's research advisor. In addition to the coursework requirements, a student must have passed two cumulative exams within the allotted time frame (see Section 2.3.3). For students working toward a terminal non-thesis M.S. degree, the degree requirements must be completed by the end of the 6^{th} semester of enrollment.

4.2. A Master's Degree Based on Research: Thesis Master's

Once a student has successfully completed the coursework requirements, he/she will work closely with his/her M.S. advisor to mature a body of research to a point suitable for a M.S. dissertation. For students working toward a terminal thesis M.S. degree, the degree requirements must be completed by the end of the 6^{th} semester of enrollment. The written document will be prepared with the advisement of the M.S. advisor and in accordance with the strict guidelines of the UF Graduate School. The formatting guidelines, rules of submission, associated forms, etc. can be found on-line.

The Electronic Thesis and Dissertation (ETD) Lab offers tutorials and workshops each semester to assist students with the preparation of their documents.

The student must work closely with the UF Chemistry Graduate Affairs Office and the UF Graduate School to make sure that proper applications are made and all deadlines are reached for the desired graduation date (see, for example, the UF Graduate Critical Dates and Deadlines page).

Once the document is completed, it will be presented to a general audience and then defended orally to the student's M.S. committee.

4.3. Defending a Thesis Master's Degree

4.3.1. *Composition of the Committee*

For the M.S. degree, the committee consists of three faculty members (including the advisor). The non-advisor members will be from within the Department and at least one should be "in-Division".

4.3.2. *Scheduling the Defense*

Students should consult section 2.5.2 of the current document for how to schedule their defense day and time. Two hours should be allotted for the final defense.

4.3.3. *Two Weeks before the Defense*

Two weeks before the final defense, the student will distribute to the supervisory committee the hard copy of the dissertation. The document should be spiral bound through a professional copy service and complete. Reminder e-mails should be sent to the committee members at appropriate times preceding the exam (complete with date, time, and room number). Candidates should consult Section 3.5 of the UF Chemistry Graduate Student Handbook for what to do in the event that a committee member is unable to attend the final defense. It should be noted that no substitutions may be made for the M.S. supervisor, and three committee members must be present at the exam.

4.3.3. *What to Bring*

The candidate should be sure to have at their final defense the following items:

- Computer, projector (if not already in the room), and laser pointer.
- One hard copy of the dissertation.
- Paperwork provided by the Chemistry Graduate Affairs Office (e.g. Final Defense form, signature pages, etc.).

4.3.4. *Rules and Format for Presentation*

Following a brief introductory statement given by the M.S. supervisor, the student will present a 30–45 minute seminar on their M.S. research using PowerPoint. This can be considered a formal seminar, but it should strike a thoughtful balance between introductory material (for attendees that may be new to the work) and scientific detail (remember, the committee has read the document). The best approach is for the student to, rather than focus on every result, hit the high points of the work performed and strive to put it into perspective. The final defense presentation is not a progress report, but rather an opportunity for the candidate to reflect on his/her achievements in the broader context of the field of organic chemistry. There may be many cases, for example, when a student might choose to present the results from selected chapters of the document (rather than touch on all of the work performed) because it makes for a more compelling and logical story.

The majority of the questions during the final defense will be saved for after the presentation. The floor is first opened to the public, after which time this group is dismissed. Questions will then come from the committee, and while these will focus largely on the dissertation document, they will also serve to have the student speak critically, holistically, and objectively about what he/she has achieved and why it is important. Specialized notes are not allowed.

4.3.5. *Outcomes*

A student can earn a pass, conditional pass, or fail for the final defense examination on the basis of the written document and its presentation/defense. A pass means that the student has fulfilled the final departmental requirement for the M.S. A conditional pass will require the student to revise the document and/or re-defend. The length of time allotted for

revising and/or re-defending will vary, with the goal of making the time as short as is reasonable for the required work. The student may not receive a M.S. without a pass.

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