Virginia Commonwealth University
Department of Chemistry

VIRGINIA COMMONWEALTH UNIVERSITY

2021-2022
Graduate Studies Handbook

DEPARTMENT OF CHEMISTRY
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TABLE OF CONTENTS

Dear Graduate Students:

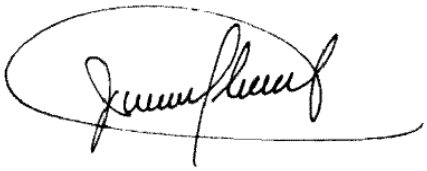
Welcome to the graduate program of the Chemistry Department at Virginia Commonwealth University. I am confident you will discover that the education you will obtain at VCU will prepare you for your professional career. I am also positive you will find the Department an enjoyable place to work and study.

This handbook is intended to serve as a general resource for policies, requirements, and procedures of the graduate programs offered by the Department. Graduate Students should also refer to the Graduate School Bulletin, which documents the official rules and regulations for graduate education at the university (http://bulletin.vcu.edu/academic-regs/grad/). The handbook also contains information regarding the structure of the Department, its personnel, and their job responsibilities.

I hope you find this information useful as you prepare to enter the program or while you are a student in the Department. If you have any questions, please feel free to contact me.

Once again, welcome to the Department of Chemistry and VCU.

Sincerely yours,



Julio C. Alvarez
Graduate Program Director

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FISCAL Office Copier Room	7-0248 (FAX)	2050	OLVPH	NONE
STOCKROOM	8-7501 (05)	3054	OLVPH	NONE
COMPUTER LAB	NO PHONE	3303	TEMPL	NONE
GSO (Grad Student Organization)	NO PHONE	3309 A&B	TEMPL	President: Samantha Gargaro ginters@vcu.edu
Humanities & Sciences Tech **(HASTECH)**	8-6180	Basement	701 W. Grace	hastech@vcu.edu
Media Support Services	8-1098		Cabell Library	NONE

Graduate Program

This handbook is a guideline of Department's policies, procedures and graduate rules under the umbrella of the College of Humanities and Sciences and the Graduate School at VCU. If you have any questions, please check with the Graduate Director.

1. General Information

The Chemistry Department has compiled this handbook to aid applicants and graduate students in understanding the policy for M.S. and Ph.D. degrees. This document is located at https://chemistry.vcu.edu/graduates/graduate-handbook/
Students are responsible for reviewing academic regulations described in the Graduate Bulletin at http://bulletin.vcu.edu/academic-regs/grad/. Questions should be addressed to the Chair and/or Graduate Director, Department of Chemistry, P.O. Box 842006, Virginia Commonwealth University, Richmond, Virginia 23284-2006, (804) 828-1298.

A. Degrees, Programs and Concentrations

Virginia Commonwealth University offers programs leading to the Doctor of Philosophy (PhD) and Master of Science (MS) degrees in Chemistry (CHEM), as well as PhD in Chemical Biology (CHEB) and Nanoscience (NANO). In cooperation with the Physics Department, VCU also offers a Ph.D. degree in Chemical Physics (CHEM PHYS). The degree of MS is offered in thesis and non-thesis tracks, while the part time option for PhD in Chemistry is also available if the applicant receives endorsement from a research advisor within the department. Students interested in these options are encouraged to contact potential research advisors prior to enrollment and secure funding as VCU does not offer financial aid for MS or part-time PhD students. Requirements and general policy Information for each graduate degree offered including concentrations can be found at: http://bulletin.vcu.edu/graduate/college-humanities-sciences/chemistry/

B. Financial Assistance

Students on the PhD track are eligible for financial assistance from VCU through graduate teaching or research assistantships (GTA or GRA), however funding from self or fellowships outside VCU are also acceptable. To qualify for financial support from VCU, students may not hold employment outside VCU and must maintain a graduate GPA ≥ 3.0 (B) as well as make timely progress towards the degree. (Graduate Bulletin http://bulletin.vcu.edu/academic-regs/grad/). **Financial aid ceases if a PhD Student transfers to MS.**
Students supported on GTA are required to teach in recitation and laboratory sections as directed by the Associate Chair. These teaching assignments are carried out under the supervision of faculty in charge of the corresponding courses.

Research assistants perform research for faculty members who are Principal Investigators (PIs) pursuing funded research programs. Typically, GTAs become GRAs after attaining PhD candidacy (in the 6th semester) at discretion of the PI and the availability of research grants.

The Department also offers a number of fellowships, which are awarded on a yearly basis and are listed in the departmental webpage including application requirements at: (https://chemistry.vcu.edu/undergraduates/departmental-scholarships/).

Financial assistance is awarded on a 9-month basis, with assistantship contract (GTA or GRA) starting on August 10th. Official Academic calendars including important landmarks for every academic semester can be found at: https://academiccalendars.vcu.edu/

Summer support may be available through GRA (from advisor's grant) or GTA when teaching during summer. This latter entails a reduced teaching load with a correspondingly lower stipend than a regular semester GTA.
The rules for awarding financial support in the form of TA, providing good standing and progress in the program, are as follows:

- A student who enters the PhD program with a bachelor's degree may anticipate support up to **FIVE CALENDAR YEARS**.
- A student who enters the PhD program with a master's degree may anticipate support up to **FOUR CALENDAR YEARS**.

C. Proficiency Examinations for CHEM and CHEM PHYS Students

Students entering the CHEM graduate program shall take proficiency examinations to gauge undergraduate knowledge in the four traditional areas of chemistry: analytical, inorganic, organic and physical. These standardized tests by the American Chemical Society take place during orientation week and the results are provided to students before registration but have no bearing on students' transcripts. Students entering the PhD CHEM PHYS program must pass proficiency examinations in two areas of chemistry and two areas of physics (mechanics; electricity and magnetism). Students entering with a bachelor's or master's degree in chemistry who have not taken the physics courses previously can satisfy the physics requirement with "A"s or "B"s in PHYS 301, 302 (classical mechanics), and 376 (electromagnetism). Students entering with a bachelor's or master's degree in physics who have not taken chemistry courses previously may satisfy the chemistry requirement with "A"s or "B"s in two of four courses, CHEM 301-302 (organic chemistry; the two-semester sequence counts as one course only), CHEM 320 (inorganic chemistry), CHEM 409 (instrumental analysis) or CHEM 510 (atomic and molecular structure).

Students entering the PhD programs in CHEB and NANO are not required to take proficiency exams.

D. Limits on Course Load and Continuous Enrollment

To be eligible for assistantship students must be full time and register at least 9 graduate credits per semester during pre-candidacy. **Once PhD candidacy is approved by the dean's office in the 5th semester, students must register one of two dissertation courses: HUMS 701 (9 credits) or 1 credit of CHEM 697. The former is mandatory for GTAs and candidates supported by Altria fellowships. During post-candidacy, students supported on GRA (advisor's grant) or self, also have the option of registering 1 credit of CHEM 697 instead of HUMS 701 to further reduce costs in tuition and fees. However, students on F-1 Visa must submit the Full-Time Equivalent Approval Request form with the Global Education Office to comply with Visa regulations.** Under assistantship support, the credits per semester must never exceed 15 or charges may apply. **Financial aid in the form of GTA may not be available when reaching 150 % of the credits required for a degree. Likewise, during candidacy and after completing coursework, students are required to register at least one credit per semester until graduation. VCU allows a maximum of 8 years to complete a PhD degree and 5 years for a MS degree.**

http://bulletin.vcu.edu/academic-regs/grad/registration-policies/
http://bulletin.vcu.edu/graduate/study/financing-graduate-school/satisfactory-academic-progress-financial-aid-purposes/
http://bulletin.vcu.edu/academic-regs/grad/time-limit/

E. Satisfactory Graduate GPA and Course Grades Allowed

Students on assistantship support whose graduate GPA falls below B (3.0) are given one semester to bring it back to B. If recovery does not occur within this time, the assistantship will be rescinded and continuation in the program will rely on self-support. **Regardless of the financial source, VCU will not approve graduation in a graduate degree with a GPA below 3.0 nor will let a course count as degree**

requirement if graded below C. Likewise, students who receive 3 unsatisfactory grades "U" in a dissertation course (CHEM 697 or HUMS 701) will be dismissed.

http://bulletin.vcu.edu/academic-regs/grad/satisfactory-academic-progress/
http://bulletin.vcu.edu/academic-regs/grad/theses-dissertations/

F. Seminar Program

This is a forum in which graduate students are exposed to visiting and local speakers from different disciplines in chemical sciences, including departmental faculty and students. The program is managed by the Graduate Administrative Assistant and the professor in charge of the seminar courses CHEM 690/692. The schedule is posted on CANVAS and is maintained by the Graduate Administrative Assistant. The program also includes special seminar series that are scheduled annually in honor of past departmental professors, like the Mary Kapp Lecture (Spring) and John Fenn Lecture (Fall). Regardless of registration to CHEM 690/692, graduate students are expected to attend seminar, which runs twice a week on Tuesdays and Thursdays from 4:00 to 5:00 pm in Oliver Hall 1024. For PhD students and during pre-candidacy, students are required to register one of two seminar courses, CHEM 690 when attending the seminar and CHEM 692 when presenting the Literature Seminar. **Once approved to PhD candidacy, students must not register any seminar course but are expected to present a Research Seminar to the department in their last semester.** For grading details, scheduling and registration policy, students should contact the professor in charge of CHEM 690/692 as well as consult the corresponding syllabus.

G. Withdrawal and Leave of Absence

Students withdrawing from any Graduate Program (CHEM, CHEB or NANO) should notify by email to the corresponding Graduate Director so that the College and the Graduate School can be informed promptly. Students are also expected to follow the checkout procedure, which is handled by the Graduate Administrative Assistant and the Building Manager. Students may request a *leave of absence* (LOA) from a program by email communication to the program director indicating withdrawal and resumption dates along with brief justification without including details if the absence is medical. The program director will forward the request to the dean for approval. More information on LOA can eb found at:

http://bulletin.vcu.edu/academic-regs/university/leave-of-absence/#:~:text=This%20is%20the%20preliminary%20(or,program%20approvals%20after%20the%20launch.

2. Graduate Committees and Personnel

A. Graduate Recruiting and Admissions Committee (GRAC)

This committee is made up of 4 to 6 rotating professors from different areas in the Department and is led by an appointed committee chair. The committee primary responsibilities include, recruiting, screening and selecting new graduate students every cycle. This committee also coordinates recruitment brochures and presentations.

B. Graduate Evaluation and Assessment Committee (GEAC)

This body is made up of 4 professors, one from each area, in addition to the Graduate Director who acts as committee chair. At discretion of the Department Chair, membership to this committee rotates yearly among departmental PIs. The primary role of GEAC is handling academic issues regarding student performance, transfers, dismissals and appeals. It also oversees compliance with graduate rules, program assessment and may override student's thesis committee.

C. Graduate Program Director (GPD)

The GPD is appointed on a rotational basis by the Department Chair. General responsibilities comprise overseeing compliance in academic policy and facilitating the operation of the Graduate Program in coordination with other parties in the department (GEAC, GRAC, etc.) and university (College and Graduate School). Every year, the Graduate Director coordinates orientation week for new graduate students, the execution and grading of proficiency exams and the schedule of cumulative exams. The GDP coordinates the annual program assessment in collaboration with GEAC and the Graduate Administrative Assistant.

D. Graduate Administrative Assistant

The Graduate Administrative Assistant provides an essential support to the function of the graduate program. Responsibilities include oral defense planning, procedural requests to the college and graduate school, seminar scheduling, orientation week preparation, poster session logistics, building access, check in and check out procedures for graduate students, scheduling of visiting speakers and graduate students.

E. Financial Manager

The Financial Manager handles and oversees financial matters pertaining grants, graduate student payroll for GTA and GRA appointments as well as travel reimbursements.

F. Building Manager

The Building Manager coordinates training and compliance to safety for all departmental personnel as well as students in teaching and research labs. Building security and Stockroom operation are also under the purview of the Building Manager. Students graduating or withdrawing from the program must sign off during checkout with the Building Manager.

G. TA Coordinator

Every semester, the distribution of TA assignments among graduate students is handled by the Associate Chair, who also coordinates the dissemination of teaching practices and standards in accord with VCU's mission. Students are encouraged to comply with these guidelines to prevent withdrawal of GTA-support.

3. Requirements for PhD in CHEM and CHEM PHYS

A. Student Learning Outcomes and Overview of Requirements

The attainment of any graduate degree conferred by the Department, relies on the completion of various requirements that are integrated in several learning outcomes:

- Demonstrate expertise in chemistry.
- Demonstrate effective oral and writing communication skills.
- Demonstrate ability to analyze data critically in chemistry.
- Demonstrate ability to conduct independent research correctly while abiding to safety and ethical standards.

In addition to these cognitive skills in preparation for diverse careers in chemistry, publication of 3 articles (one per thesis chapter) in peer-review outlets is an adequate expectation for the PhD degree. Research articles and presentations at conferences and other forums, significantly enhance job prospects.

Table 1 illustrates the major PhD requirements during pre- and post-candidacy for a student entering in Fall with a timeline of 10 semesters. Students however can finish in less than 5 years, if requirements

are fulfilled early. Ideally, going from GTA to GRA is expected during post-candidacy if research funding becomes available. **In any case, no GTA support is provided beyond the 10th semester and students are encouraged to follow the registration timeline outlined in Table 1.** This includes completing the pre-candidacy requirements of courses, cumulative exams, and literature seminar in a timely manner. The tuition waiver for GTAs or GRAs during post-candidacy only allows registration of dissertation credits from HUMS 701 or CHEM 697, therefore, every other course must be taken during pre-candidacy while keeping a load between 9 to 15 credits per semester. GTAs and GRAs must maintain full-time status by registering at least 9 credits of graduate courses per semester adjusting with CHEM 697 as needed. An exception to this rule is given to GRAs during post-candidacy, who can choose between registering 9 credits of HUMS 701 or 1 credit of CHEM 697. The latter allows savings in tuition paid from advisor's grant and fees paid by the student. GRAs on F-1 visa wishing to register 1 credit of CHEM 697 during post-candidacy must submit the Full-Time Equivalent Approval Form to the Global Education Office.

Table 1. Example of 10-semester timeline for PhD in Chemistry

PRE-CANDIDACY				
1	**2**	**3**	**4**	**5**
Area Core courses (9) CHEM 690 (1) CHEM 693 (1) CHEM 697 (1) Advisor selection Dec 1[a]	Elective courses (9) CHEM 690 (1) CHEM 697 (1) CHEM 698 (1) CUMULATIVE EXAMS Committee selection Feb 1[b]	CHEM 690 (1) CHEM 697 (7) CHEM 699 (3)	CHEM 697 (9) CHEM 692 (1) LITERATURE SEMINAR	CHEM 690 (1) CHEM 697 (9) CANDIDACY EXAM[c] Candidacy Application
12 credits	12 credits	11 credits	10 credits	10 credits
POST-CANDIDACY				
6	**7**	**8**	**9**	**10**
HUMS 701 (9)[d]	HUMS 701 (9)[d]	HUMS 701 (9)[d]	HUMS 701 (9)[d]	HUMS 701 (9)[d] THESIS DEFENSE RESEARCH SEMINAR
9 credits	9 credits	9 credits	9 credits	9 credits
TOTAL CREDITS = 100 including 72 of dissertation (CHEM 697 + HUMS 701)				

[a]*Obtain Department Chair's approval and notify Graduate Administrative Assistant.* [b]*Notify Graduate Administrative Assistant.* [c]*Dismissal or transfer to MS will ensue if not completed by the end of the 5th semester.* [d]*Requires approved candidacy status and can be replaced by 1 credit of CHEM 697 for GRAs.*

B. Course Requirements

Students must take a minimum of 18 credits of graduate didactic courses, including 9 credits in three core areas and 9 credits of approved electives (Tables 2 and 3). Ideally, this course load should be completed during the first year or at least by the end of the third semester. **Students are urged to confirm their progress using DegreeWorks, which is VCU online system that automatically tracks and verifies coursework.** Non-didactic courses like CHEM 693 (Chemistry Perspectives and Ethics) and CHEM 698 (Investigation in Chemical Literature) must be taken during the first year and before presenting the Literature Seminar (CHEM 692).

Starting from semester 1, students are expected to register dissertation credits every semester as needed (Table 1). **This requirement can be fulfilled with two courses, CHEM 697 (Directed Research) or HUMS 701 (Post-Candidacy Doctoral Research).** The latter is a 9-credit course with a reduced tuition rate only available for PhD candidates. GRAs who are also approved candidates can select 1 credit of CHEM 697 instead of HUMS 701 to further lower the costs of tuition to advisor's grant and fees paid by the student (1 credit instead of 9). **This option is also available to GRAs on F-1 visa upon approval of the Full-Time Equivalent Request form by the Global Education Office.** The grade for either course is S (satisfactory) or U (unsatisfactory) and is provided by advisor. Sections of CHEM 697with variable number of credits are offered every semester to facilitate reaching the number of credits needed. Candidates on supported on GTA or Altria must register HUMS 701 without exception.

Table 2. Summary of Requirements for PhD in CHEM (Min. 60 credits total)

Course Requirement			**Credits**	**Timeline**
CHEM 504 Advanced Organic		Area core courses	3	1st fall semester
CHEM 510 Atomic and Molecular Structure			3	
CHEM 520 Advanced Inorganic			3	
CHEM 693 Chemistry Perspectives and Ethics			1	
Electives from Table 3			9	1st spring and/or 2nd fall semesters
CHEM 690 Research Seminar			1 (taken 4 times)	Pre-candidacy semesters 1 to 5
CHEM 698 Investigation in Current Chemistry Literature			1	Prior to Literature Seminar Presentation
CHEM 692 Seminar Presentation (Literature) to committee [a]			1	3rd or 4th semester
CHEM 699 Scientific Writing in Chemistry			3	Starting 1st fall semester but before 5th
Dissertation Courses	CHEM 697 Directed Research		32	Pre- and Post-Candidacy
	HUMS 701 Post-candidacy Doct. Res.			Post-Candidacy Only
Other Requirements				
Cumulative Exams (2 to 3)				2nd semester
Oral Candidacy Exam				Before the end of 5th semester
Application for Candidacy				Immediately after passing Candidacy exam
Research Seminar to the department				Last semester
Thesis manuscript (3-5 chapters) and final defense				Last semester
Electronic Thesis upload and Application Graduation				After passing final defense

[a] *Students must register CHEM 692 instead of CHEM 690 during the semester presenting the Literature Seminar.*

Table 3. List of Core (C) and Elective (E) Courses Currently Offered*

	AREA OR TOPIC	**COURSE**	**NAME**	**CREDITS**	**SEMESTER**
DIDACTIC	ANALYTICAL	CHEM 630 (E)	Electroanalytical Chemistry	1.5	Spring
		CHEM 631 (E)	Separation Science	1.5	Fall
		CHEM 633 (E)	Mass Spectrometry	1.5	Fall
		CHEM 635 (E)	Spectrochemical Analysis	1.5	Fall
		CHEM 636 (E)	Biosensors	1.5	Spring
		CHEM 637 (E)	Electrochemistry Applications	1.5	Spring
	INORGANIC	**CHEM 520 (C)**	Advanced Inorganic	3.0	Fall
		CHEM 622 (E)	Solid State & Materials	1.5	Spring
	ORGANIC	**CHEM 504 (C)**	Advanced Organic I	3.0	Fall
		CHEM 604 (E)	Advanced Organic II	3.0	Spring
		CHEM 506 (E)	Introduction to Spectroscopic Methods	1.5	Spring
		CHEM 606 (E)	Advanced Spectroscopic Methods	1.5	Spring
		CHEB 601 (E)	Chemical Biology I	3.0	Fall
		CHEB 602 (E)	Chemical Biology II	3.0	Spring
	PHYSICAL	**CHEM 510 (C)**	Atomic and Molecular Structure	3.0	Fall
		CHEM 511 (E)	Chemical Thermodynamics and Kinetics	3.0	Spring
		CHEM 512 (E)	Applied Molecular Modeling	3.0	Spring
		CHEM 691 (E)	Nanomaterials Energy & Environ Applications	3.0	Spring
	EDUCATION RESEARCH	CHEM 591 (E)	Introduction to Chemical Education Research	1.5	Spring
	LITERATURE ANALYSIS & WRITING	CHEM 698	Investigations in Current Chemistry Literature	1.0	Fall & Spring
		CHEM 699	Scientific Writing in Chemistry	3.0	Fall
NON-DIDACTIC		CHEM 690	Research Seminar	1.0	Fall & Spring
		CHEM 692	Seminar Presentation	1.0	Fall & Spring
		CHEM 693	Chemistry Perspectives and Ethics	1.0	Fall
		CHEM 696	Professional Skill Development (MS students only)	3.0	Fall & Spring
DISSERTATION COURSES		CHEM 697	Directed Research	1.0 to 11.0	Fall & Spring
		HUMS 701	Post-Candidacy Doctoral Research	9.0	Fall & Spring

**Subject to change. Students should corroborate actual course offering in the Schedule of Classes link on VCU website.*

Students in the CHEM PHYS program are required to complete CHEM 510 or PHYS 580 plus CHEM 511, CHEM 612, PHYS 576, and PHYS 641 in addition to three courses from the following list: CHEM 512, 550, 591, 610, 611, 615, 616, 620, 634, 635, 691; PHYS 550, 571, 573, 591, 661, 691; MATH 517, 518; NANO 650, 651. A minimum of four graduate courses must be in chemistry. These students may also substitute 15 credits of PHYS 697 for 15 credits of CHEM 697.

C. Course Waivers and Optional Undergraduate Courses

Students can request **Waivers** for courses taken at previous institutions or VCU by emailing the Graduate Director attaching the syllabus of the course taken previously and the course at VCU to be waived. Once content is verified to be equivalent, the Graduate Director files a waiver request to the College, which typically takes 3 weeks for approval. **This process waives the content of the course but not the credits, therefore students must replace the credits of the course waived with dissertation credits.** The course to be waived should be graded B or higher and appear on the official transcript of the previous institution.

For students interested in refreshing basic knowledge in a core area, optional registration of undergraduate courses concurrent with the graduate courses is possible and without impact on graduate GPA. **However, students having no coursework experience in undergraduate Instrumental Analysis are required to take CHEM 409.**

D. Cumulative Exams

These are take-home exams aimed at expanding knowledge and enhancing critical analysis of selected topics of chemistry. The tests are written jointly by the faculty in each division (analytical, organic, inorganic, and physical) and offered simultaneously in the 4 areas, three times a semester on the second Saturday of the month. Evaluation is also performed jointly using a pass/fail criterion determined by each division and the grades are communicated to the students before the following exam. On the designated Saturday morning, students receive the exam by email at 9:00 am and return the answers no later than 3 hours later at 12:00 pm. Cumulative exams must be completed during the 2nd semester of PhD and to finish this requirement, students need to pass two exams, one on the area of concentration, and another outside the area. **Students not passing one of the two exams are required to take a third one, but should failure persist, transfer to MS will ensue.** Topics are announced at 2:00 pm on Friday a week prior to the exam and students must declare the exam area they will take by the following Tuesday using a google form sent to them.

E. Attendance (CHEM 690) and Seminar Presentation to committee (CHEM 692)

Attendance to the seminar is expected throughout the PhD but is only tracked during pre-candidacy with the grade for CHEM 690 (S or U). Every PhD student must present a Literature Seminar during the second year (3rd or 4th semester) in a topic from the latest chemistry literature. In the semester presenting the seminar, students are also required to register CHEM 692 instead of CHEM 690. This seminar is graded using the letter scale A to F. The objective of the seminar presentation is to broaden expertise, build up communication skills and sharpen critical analysis. **Once a topic is approved using the Literature Seminar Approval Form (see appendix), students must email the signed form (pdf) to the Graduate Administrative Assistant, the professor for CHEM 692 and their thesis committee.** Students must also email the seminar abstract to committee two weeks before the seminar date and ensure to practice at least once in front of advisor and other students. The title and date of the seminar should be notified to the Graduate Administrative Assistant to secure room reservation and guarantee that the committee will have the rubric to grade the seminar. For guidelines on abstract preparation and seminar policy, students should consult the syllabus for CHEM 692/690 or ask the professor in charge of those courses.

After the Q&A session, each committee member evaluates the performance using the rubric in Table 4. In this score system, 100 to 85 is equivalent to A, 84 to 65 is B, and anything below 64 is C. Following deliberation led by the committee chair, individual faculty scores are combined to produce a single rubric that goes on file with all signatures. Before adjourning the meeting, the committee chair communicates the unified grade and recommendations to student. The committee chair should return the signed form

to the Graduate Administrative Assistant so that an official grade can be submitted to the registrar by the professor in charge of CHEM 692. Students getting a C are allowed to repeat the seminar at committee's discretion and after requesting the professor in charge of CHEM 692 to file an incomplete grade "I". This requires a retroactive change of grade the following semester when the grade of the redo becomes available. If committee and student agree on a C without repeat, the student must have an A in another course to prevent the GPA going below B.

Topic selection for the literature seminar must be conducted following these guidelines:

- No direct overlap with student's research.
- It cannot include published work by student's advisor, collaborators or competitors.
- The student should be unfamiliar enough with the topic so that it constitutes an achievable challenge. Research articles must be from the last three years.

Table 4. Seminar Evaluation

		Does not Meet	Meets	Exceeds
	Score	0 to 5	6 to 8	9 to 10
Organization				
1. Ability to clearly explain a topic in the appropriate depth				
2. Ability to use slides and visual aids effectively				
3. Ability to communicate scientific information to an audience in a clear and understandable fashion				
4. Demonstrate breadth of knowledge in chemistry				
Delivery				
5. Ability to hold the audience's attention				
6. Ability to stay within the required time (40-50 mins excluding questions)				
Questions				
7. Ability to grasp material presented				
8. Depth of understanding of the topic and relevant background material				
Other				
9. Ability to write an abstract that properly conveys the content of a seminar				
10. Overall professionalism of the talk (e.g. punctuality, attire, etc)				
TOTAL/100 PTS				

F. Oral Candidacy Exam (Proposal Defense)

Schedule and Candidacy Application.

The Oral Candidacy Examination or Proposal Defense must be completed no later than the end of the 5th semester, which is regarded as the last day of Final Exams in the Monroe Park Campus according to the VCU calendar. **Failure to meet this deadline will result in automatic dismissal or transfer to MS depending on the case.**

Once a defense date is agreed upon with the committee, the student must communicate this information along with the Title of the Proposal to the Graduate Administrative Assistant. This will ensure that a Defense Package with records and forms for Evaluation and Candidacy Application will be ready for signing after the defense. The student must reserve the room for the defense and apply to candidacy with the Graduate Administrative Assistant after passing the exam. **This application must be done swiftly as tuition during post-candidacy (paid by VCU or advisor's grant) is 50% or lower than in pre-candidacy.** Students must fill out a DocuSign form, then submit it for signing to CHSGRADDEAN@VCU.EDU. The form must include the names of the committee members and the current *Associate Dean of Research and Operations* for the college (https://chs.vcu.edu/about/directory/).

Manuscript Sections.

Students must write an original manuscript describing their current research results along with a section of proposed future work. This manuscript must be sent to each member of the thesis committee a week prior to the scheduled defense. Regardless of format, NIH or NSF proposal, it is highly recommended to include the following sections:

- A section of **preliminary results** describing relevant experimental outcomes obtained since student started the research.
- A section describing the **gap in knowledge (unknown), research problem or statement of critical need** to be addressed by the proposed project. This section should also include a background on known facts about the problem/gap-in-knowledge/critical need.
- A section proposing a **solution to the problem** encompassing the pursuit new knowledge (*i.e.* long-and short-term goals, along with ~3 specific aims to attain those goals).
- A section explaining the **significance** and **payback** for addressing the problem.
- A section describing the **specific aims** to be pursued as logical steps of the long and short-term goals.
- A **proposed approach or research plan** to carry out each specific aim, discussing expected outcomes and data analysis.
- A section of bibliographic **references**.

Manuscript Format.

- Maximum of 15 pages, numbered and in single space, or 30 pages in double space without including bibliography.
- Font size 11 (Arial, Helvetica or palatino linotype) with 1-inch margin all sides.
- Bibliographic references should be in the style of *The Journal of The American Chemical Society* (JACS) including **article titles and inclusive pages**. A minimum of 25 references must be cited with no more than 30% citations from the student's research group.
- The research plan section must be *at least* 20 % of the manuscript which is equivalent to 3 pages in single space or 6 pages in double space.
- Figures, schemes and equations must be numbered and embedded in the section of text where they are being described.
- The writing style must be clear and simple suited for general readership in chemistry.

Manuscripts that do not comply with these guidelines may be returned by the committee without revision. Students are encouraged to seek proofreading and writing support from the VCU Writing Center http://writing.vcu.edu/.

Evaluation.

Table 5. Grading of Student Learning Outcomes

		Score	Does not Meet	Meets	Exceeds
			1 to 5	6 to 8	9 to 10
SLO					
1. Demonstrate breadth and depth in chemistry					
2. Demonstrate effective oral and writing communication skills in chemistry	Oral presentation				
	Candidacy/Thesis manuscript				
3. Demonstrate ability to analyze data critically					
4. Demonstrate ability to conduct independent research correctly while abiding to ethical and safety standards	Project progress				
	TOTAL				

On the day of the defense, the examination begins with the student giving a 20-minute presentation summarizing the major points of the manuscript followed by rounds of Q&A from the committee. Each committee member evaluates performance using a rubric that assigns scores to various student learning outcomes (SLO) as shown in Table 5.

Despite passing the exam, a score ≤ 5 in a SLO may require improvement and timely follow up at committee's discretion (*i.e.* progress update, written report, or other assignment). Additionally, for assessing **project progress** (SLO 4) the committee may rely on advisor's perspective as well as the research products (*i.e.* peer-review publications, posters, presentations, etc.) generated by the student (see full Defense Evaluation Form in appendix). During deliberation led by the committee chair, scores from individual members are combined to come up with a unified quantitative evaluation that will go on record with signatures. The committee is expected to take a holistic approach so that depending on the case, a second opportunity may be granted when the overall performance is deemed unsatisfactory (*i.e.* total score ≤ 25). **The second attempt must occur within 4 weeks of the date of the original exam date and should the result persist, the student will be transferred to MS with TA-support ending in the 6th semester. Rubric(s) from every attempt, scored and signed, must be kept on record.**

G. Final Dissertation Defense

Every student is expected to complete an original research project under the guidance of an advisor and its results must be reported in a dissertation manuscript describing the research significance in relation to existing knowledge. Guidelines for preparation of the thesis can be found in the Graduate Dissertation Manual:

https://graduate.vcu.edu/media/graduate-school/docs/pdf/ThesisandDissertationmanual8.27.2018.pdf

When advisor and student determine that sufficient research has been completed to write a **dissertation of 3 to 5 chapters (~ 3 to 5 research articles)**, the student should schedule the defense with the committee. The student should also notify the Graduate Administrative Assistant of the thesis title so that a venue can be reserved for the intended date. Copies of the dissertation should be made available to the committee one week prior to the defense.

Given that the PhD is awarded for addressing an original problem in research, evidence of publication (at least one manuscript draft submitted) in a peer-review journal should be presented to the committee at the time of the defense. Nevertheless, to maximize job prospects and expand career opportunities, students are urged to produce as many publications as possible, at least one per thesis chapter.

The evaluation of the thesis defense follows the format of the Oral Candidacy Exam using the same Defense Evaluation form to assess the same SLOs. Upon successful defense, the student must correct the manuscript following directions by the committee. The final version must be submitted online following the instructions described in the Electronic Thesis and Dissertation (ETD) webpage: http://www.graduate.vcu.edu/student/thesis.html) before the deadline listed on the VCU calendar.

H. Research Seminar Presentation to the department

In the semester of graduation, every student must present a seminar about the research performed at VCU. The objective of this presentation is to describe the investigation results in front of the departmental audience. To facilitate public announcement, students must email the seminar abstract to the Graduate Administrative Assistant two weeks in advance. Therefore, presenters are urged to schedule the seminar during regular schedule (Tuesdays or Thursdays 4:00 to 5:00 pm) or get permission from the professor in charge of seminar program when presenting at a different time. In the latter case, students must secure room reservation with the Graduate Administrative Assistant. The performance is still assessed with the evaluation form used for Literature Seminar (Section 3E) but the grade will not appear in transcript, therefore PhD students **must not register CHEM 692 for this seminar**.

I. Application to Graduation

During the first week of the semester of graduation, students must declare intent to graduate on e-services. Concurrently, they also need to schedule their thesis defense and research seminar (section 3H) while informing the Graduate Administrative Assistant of dates and title. Because VCU requires registration of at least 1 credit during the semester of graduation, graduating in summer will generate additional tuition and fee charges that will apply to the student or advisor's grant if on GRA support. After passing the final defense and submitting the thesis evaluation form (Appendix) to the Graduate Administrative Assistant, students must apply for graduation using the DocuSign link emailed to them. This will start the automated signing of the thesis by the required parties if the application is addressed to CHSGRADDEAN@VCU.EDU. In order to participate in the hooding ceremony at commencement, students must have completed all PhD requirements, including electronic thesis submission. The Graduate School contacts students directly to let them know they have been approved for the hooding ceremony.

4. Requirements for PhD in CHEM with Chemical Education Focus

Students may select a chemical education focus for their PhD. These students will include chemical education research and work on an "atoms and molecules" project encompassing a traditional area of chemistry (physical, analytical, organic, inorganic, or chemical physics). Consequently, students are encouraged to publish in both areas. Likewise, the Department offers a course in Chemical Education Research, CHEM 591, as well as cumulative exams in research education topics. All other requirements are identical to those for the PhD in CHEM.

5. Requirements for MS in CHEM with Thesis and Non-Thesis Options

A. Student Learning Outcomes and Overview of Requirements

The learning outcomes for MS in chemistry are the same as for PhD (Section 3A). Students are expected to complete core and elective courses (Table 6) adding up to a total of 30 credits. There is no financial assistance for MS in chemistry. Students must take proficiency exams in analytical, inorganic, organic, and physical chemistry during orientation week, and the results should be used to select the appropriate elective courses. The maximum time allowed by VCU to complete a MS degree is 5 years.

Table 6. Summary of Requirements for MS in CHEM (Min. 30 Total Credits)

Course Requirement		**Credits**		**Timeline**
		Thesis	**Non-Thesis**	
CHEM 504 Advanced Organic	Area core courses	3	3	1st fall semester
CHEM 510 Atomic and Molecular Structure		3	3	
CHEM 520 Advanced Inorganic		3	3	
CHEM 693 Chemistry Perspectives and Ethics		1	1	
Electives from Table 3		6	9	1st spring and/or 2nd fall semesters
CHEM 696 Professional Skill Development		3	3	2nd semester
CHEM 698 Investigation in Current Chemistry Literature		1	1	2nd semester
CHEM 692 Seminar Presentation to committee[a]		1	1	Last semester
CHEM 697 Directed Research		9	6	Throughout the degree
Other Requirements				
Application for Candidacy		yes	yes	After completing courses
Thesis manuscript (1-2 chapters) with defense to committee		yes	no	Last semester
Written Project Report with defense to Committee		no	yes	Last semester
Application for Graduation		yes	yes	After passing defense

[a] *This presentation comprises the research described in the thesis or the written project report for the non-thesis option*

For the **thesis option**, students are expected to conduct a stint of original research guided by an adviser and requiring a minimum of 9 credits of Directed Research (CHEM 697). The results of this investigation

are to be written in a thesis manuscript that is defended orally to the committee after a seminar presentation (CHEM 692). The non-thesis option contemplates a minimum of 6 credits of CHEM 697 comprising a project of non-original research guided by adviser in the department or a scientist at a an industrial or government lab. The latter two cases require a co-adviser in the department and can be carried out while the student is in full employment or during an internship. Students must also write a report of the project including an oral defense to the committee after a seminar presentation (CHEM 692). Table 6 summarizes the MS requirements also outlined in the graduate bulletin at:

http://bulletin.vcu.edu/graduate/college-humanities-sciences/chemistry/chemistry-ms/#degreerequirementstext

PhD students can transfer to MS after emailing the request to Graduate Director and selecting the thesis option most compatible with their curricular status. Tables 7 and 8 illustrate registration timelines for both the thesis and non-thesis options of the MS degree.

Table 7. Example of 4-semester timeline for MS CHEM Thesis Option

SEMESTER			
1	**2**	**3**	**4**
Area Core courses (9) CHEM 693 (1) Advisor selection by Dec 1 or May 1[a]	Elective courses (6) CHEM 698 (1) CHEM 696 (3) Committee selection by Feb 1 or Sep 1[b]	CHEM 697 (5)	CHEM 692 (1) CHEM 697 (4) RESEARCH SEMINAR & DEFENSE TO COMMITTEE
10 credits	10 credits	5 credits	5 credits
TOTAL CREDITS = 30 including 9 of CHEM 697			

Table 8. Example of 4-semester timeline for MS CHEM Non-Thesis Option

SEMESTER			
1	**2**	**3**	**4**
Area Core courses (9) CHEM 693 (1) Advisor selection by Dec 1 or May 1[a]	Elective courses (9) CHEM 698 (1) CHEM 696 (3) Committee selection by Feb 1 or Sep 1[b]	CHEM 697 (3)	CHEM 692 (1) CHEM 697 (3) RESEARCH SEMINAR & DEFENSE TO COMMITTEE
10 credits	13 credits	3 credits	4 credits
TOTAL CREDITS = 30 including 6 of CHEM 697			

[a] *Fall or Spring entering students are to obtain Department Chair's approval and notify Graduate Administrative Assistant.*

[b] *Fall or Spring entering students are to notify Graduate Administrative Assistant.*

B. Research Seminar Presentation to committee (CHEM 692)

In the semester of graduation, every MS-student must present a seminar about the research performed during the degree. For MS students, this presentation is graded through CHEM 692 using the letter scale A to F. A seminar abstract must be emailed to the committee two weeks before the seminar date and ensure to practice at least once in front of advisor and other students. The title and date of the seminar should be emailed to the Graduate Administrative Assistant to reserve a room and have the grading rubric sent to the committee. For guidelines on abstract preparation and seminar policy, students should consult the syllabus for CHEM 692 or ask the professor in charge of the course. After the Q&A session, each committee member evaluates the performance using the rubric in Table 4. In this score system, 100 to 85 is equivalent to A, 84 to 65 is B, and anything below 64 is C. Following deliberation led by the committee chair, individual faculty scores are combined to produce a single rubric that goes on file with

all signatures. Before adjourning the meeting, the committee chair communicates the unified grade and recommendations to student. The committee chair then returns the signed form to the Graduate Administrative Assistant so that an official grade can be submitted to the registrar by the professor in charge of CHEM 692. Students getting a C are allowed to repeat the seminar at committee's discretion and after requesting the professor in charge of CHEM 692 to file an incomplete grade "I". This requires a retroactive change of grade the following semester when the grade of the redo becomes available. If committee and student agree on a C without repeat, the student must have an A in another course to prevent the GPA going below B.

C. Final Defense and Application to Graduation

During the first week of classes in the graduation semester, students must declare intent to graduate in e-services and plan for a defense to the committee about their research. This defense should be done during the Q&A session of the research seminar but evaluated with the rubric in Table 5 and aside from the seminar evaluation (see section 5B). Therefore, students must email title and date to the Graduate Administrative Assistant so that the defense evaluation form is provided to the committee for signing. Once the committee chair returns the signed form to the Graduate Administrative Assistant, students must apply for graduation following instructions in the link emailed to them and making sure the application is addressed to CHSGRADDEAN@VCU.EDU including the name of the current *Associate Dean for Research and Operations* of the college (https://chs.vcu.edu/about/directory/). This automated signing must be initiated only after uploading the final version of the thesis prior to the deadline listed in the academic calendar and following the instructions described on http://www.graduate.vcu.edu/student/thesis.html. The procedure for non-thesis students is identical, except that instead of thesis a written report is defended to the committee and during the automated signing the system does not demand an upload of a written document but just the required signatures.

6. Course Registration

To register online, go to *www.vcu.edu* and click on "Register for Classes" on the top menu, then select "Register for Classes Using e-services". You will need the course registration number (CRN) which can be found by clicking on "Schedule of Classes" on the same webpage. After picking the current semester, selection of CHEM, CHEM BIO, or NANO, will display the courses offered in those subjects. When clicking in a particular course, you can determine its CRN, instructor, sits available, course capacity, time and location. The system does not allow registration of courses with conflicting schedules. However, should your TA assignment overlap with CHEM 690, you can still register the course but the professor in charge of CHEM 690/692 needs to be informed that your attendance to seminar will be limited because of TA. In case of getting a no-registration message because of lacking a pre-requisite, email the Graduate Director to authorize an override.

Typically, students devote the first semester to satisfy the core courses while registering electives in the second semester (Table 2). In any case, the primary goal is to complete the 18-credit minimum of didactic courses by the end of the first year or at least by the 3rd semester. Ideally, the 9-credit core selected should be aimed at offsetting weaknesses disclosed in the proficiency exams. Students are strongly encouraged to follow these guidelines when registering every semester:

- To receive stipend and tuition support, students must have full time status, which during pre-candidacy requires registration of 9 graduate credits per semester.
- Do not register more than 15 credits/semester and register before the end of add/drop period, which typically at the end of the 1st week of classes (see https://academiccalendars.vcu.edu/)
- Register CHEM 693 in the first semester and CHEM 698 in the 2nd semester.
- Register CHEM 692 (Literature Seminar) one semester during the 2nd year.

- Do not register credits during summer unless graduating in a summer session. If this is the case, credit and fee charges will apply to student or advisor's grant.
- After PhD candidacy, register HUMS 701 when on TA or RA-support. If approved for 1 credit/semester (CHEM 697), make sure to comply with the continuous enrollment requirement while being mindful of the time limit for degrees (Section 1D).

7. Incomplete Grades

In some cases, professors submit an incomplete grade "I" to the registrar when a student does not complete assignments or exams in a course. In such circumstances students are urged to contact the professor and address the source of the "I" grade immediately because those grades are converted automatically to F by VCU at the end of the following semester (see VCU calendar).

8. Research Advisor Selection and TA/RA Ratio per PI

In a session during orientation week, departmental PIs present summaries of their research to the entering graduate class. Students are urged to meet individually with as many PIs as possible to discuss potential projects. Attendance of the Graduate Poster Session in October, when graduate students present their individual projects, is mandatory. **Students are urged to have at least three choices for advisor and are expected to obtain selection approval from the Department Chair no later than December 1. A "U" grade in CHEM 697 will be assigned if this deadline is not met. Once advisor selection is approved, students must notify the Graduate Administrative Assistant for record keeping.**

Students and advisors who meet to ponder a decision of working together, are strongly encouraged to consider the following guidelines:

- Tenured faculty members (Associate and Full professors) with no extramural funding are allowed a maximum of two students on GTA (supported by VCU).
- Tenured PIs with extramural funding are expected to maintain at least 1 student on RA funding per every 2 GTAs.

This policy is justified by the finite number of TA appointments available and the imperative need to transition students from GTA to GRA at candidacy (6th semester) when they complete the required coursework and can dedicate full-time to research. Furthermore, every released GTA position translates into a new student entering the program each year, thus enhancing funding impact and improving chances of research productivity.

9. Thesis Committee Selection

In consultation with advisor, students should select a thesis committee made of at least 4 members including advisor and an out-of-department member. Ideally this committee should also have one member from the student's concentration area and another from out-of-area. This guideline should be followed in so far as the number of "free" faculty allows it. In the end students and advisors must select committee members from the list of available faculty members compiled every semester by the Graduate Administrative Assistant. This list is updated every semester based on the limit of thesis committee memberships per PI**. Students must notify the Graduate Administrative Assistant by February 1 (entering in Fall) or September 1 (entering in Spring) of their committee so that the corresponding paperwork can be initiated with the College and the Graduate School.**

10. Graduate Poster Session

All graduate students past their first summer of research are required to present a poster on their research progress at the Graduate Poster Session scheduled every fall semester. Students must e-mail the poster file (pdf) to their thesis committee and let them know of presentation times so that members

can stop by the poster. Students must follow Graduate Administrative Assistant instructions for printing posters and presentation scheduling. Students graduating in the fall should consult with their advisor to determine if they have to present poster.

11. Support for Graduate Student Travel

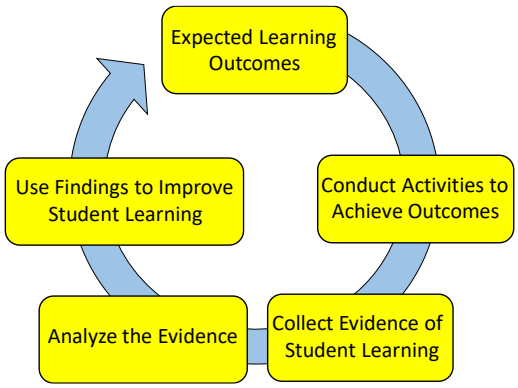
Students can apply for travel departmental support ($400) once during their PhD or MS if they maintain full time status. To qualify for this financial aid, the applicant must be the first author of the presentation at the intended conference. Students must fill out the application travel application form (Appendix) and have it signed by the Graduate Director. Subsequently, students should deliver the signed form to the Financial Manager for processing.

12. Career Plans

Beyond acquiring specialized knowledge in chemistry, benefits of doctoral education comprise a set of transferable skills that include **complex problem-solving, critical reasoning and thinking in-depth from different perspectives**. These skills, which are represented in the SLOs described in section 3.A, are advantageous in any professional environment but particularly in non-academic settings where a more diversified workforce is expected and doctorate holders can distinguish themselves from colleagues. In addition to the goal of cultivating these skills and producing publications as part of the graduate degree, students are encouraged to begin mapping out career paths as early as they can. There are internet sites like https://www.acs.org/content/acs/en/careers.html (from the American Chemical Society, ACS), which has a "career navigator app" that provides resources and information pertaining different professions in chemical sciences. The site https://cheekyscientist.com/ specializes in helping science PhD holders find their career niche. Likewise, VCU offers courses like GRAD 615 Careers in Biomedical Sciences and GRAD 610 Career Planning for Graduate Students, which also provide career advice and resources.

13. Assessment of Student Learning Outcomes

In order to maintain curriculum integrity and monitor its alignment with SLOs, the department performs an annual evaluation using the assessment management software TaskStream in compliance with the VCU-Provost office: https://provost.vcu.edu/academics/assessment/



This initiative is aimed at attaining the following goals:

- Maintain an evidence-based repository of student's learning on an annual basis.
- Provide students with the opportunities they need to achieve the expected learning by making judicious curriculum modifications based on the learning data collected.
- Maximize student's success not only in the program but after graduation when transferable skills derived from SLOs become the bedrock of work performance.

The Curriculum Map for the CHEM-Graduate Program (Appendix) shows every requirement and graduate course tabulated in line with the SLOs listed in section 3.A. The assessment is conducted annually whereby data collected is presented to the department and analyzed during the Faculty Retreat every August. Faculty and thesis committees directly collect most of the data but the Graduate Director, GEAC and the Graduate Administrative Assistant help in putting together tables and summaries that are presented for analysis and discussion. Grades from courses and quantitative evaluations obtained with rubrics for different requirements make the core of the data collected but research products like conference attendance, presentations and publications are also considered.

APPENDIX

Important Forms and Rubrics

Approval Form for Literature or Research Seminar

Date: _____

Student name: _____

Advisor name:_____

Important: Once the seminar date has been assigned, the student may not cancel or delay the seminar without permission from his/her committee. Abstracts are due to the CHEM 690/692 professor two weeks prior to the seminar date.

Proposed Title:

Description of topic (for literature seminar):

List of pertinent references including titles (at least 3 recently published – for literature seminar):

Seminar Date and time: _____

Location: _____

Approved: Sign and Date

Research Advisor_____

<u>Below area is for literature seminar only</u>

Committee member_____

Committee member_____

Committee member_____

Committee member_____

Committee member_____

Literature or Research Seminar Rubric

Student's name _____ Semester student entered graduate school_____

Area of Concentration_____ Today's date_____

To Research advisor:

Date(s) and time of practice for literature seminar with student (must be at least 1):

List names of students present at practice for literature seminar (must be at least 4):

Comments:

To Committee Chair: please give each committee member a copy of this rubric at the beginning of the exam. The copy that goes on record will have the signatures and the **average score** per graded item.

Seminar Evaluation

		Does not Meet	Meets	Exceeds
	***Score**	**0 to 5**	**6 to 8**	**9 to 10**
Organization				
1. Ability to clearly explain a topic in the appropriate depth				
2. Ability to use slides and visual aids effectively				
3. Ability to communicate scientific information to an audience in a clear and understandable fashion				
4. Demonstrate breadth of knowledge in chemistry				
Delivery				
5. Ability to hold the audience's attention				
6. Ability to stay within the required time (40-50 mins excluding questions)				
Questions				
7. Ability to grasp material presented				
8. Depth of understanding of the topic and relevant background material				
Other				
9. Ability to write an abstract that properly conveys the content of a seminar				
10. Overall professionalism of the talk (e.g. punctuality, attire, etc)				
***TOTAL/100 PTS**				

*A = 100-85; B = 84-65; C ≤ 64. Students graded C are allowed to repeat the seminar at committee's discretion.

Recommended grade:_____

Comments/Justification:

<u>Below area is for literature seminar only</u>

Is a second seminar required: Yes/No; if yes, when?_____

NAMES AND SIGNATURES OF COMMITTEE MEMBERS INCLUDING DATE

Chair:_____Department of _____

Advisor:_____Department of _____

Member:_____Department of _____

Member:_____Department of _____

Member:_____Department of _____

COLLEGE OF HUMANITIES AND SCIENCES
DEPARTMENT OF CHEMISTRY

Defense Evaluation Form

TYPE OF EXAM ☐ PhD Oral Candidacy 1st Try ☐ PhD Oral Candidacy 2nd Try
☐ PhD Committee Update ☐ PhD Thesis Defense ☐ Master Thesis Defense

Student's name _____Started in:_☐ FALL ☐ SPRING OF_____

Area of Concentration_____Today's date_____

To Committee Chair: please give each committee member a copy of this rubric at the beginning of the exam. The copy that goes on record must have all signatures and the average score per Student Learning Outcome (SLO). Despite passing the exam, a second meeting may be required by the committee to drive improvement on a SLO. Second attempts in the Oral Candidacy Exam must be within 4 weeks of today's date and should an unsatisfactory result persist at that point, transfer to MS will ensue. In that case, TA support will only be available until the 6th semester.

I. SLO EVALUATION

		*Score	Does not Meet 1 to 5	Meets 6 to 8	Exceeds 9 to 10
SLO					
1. Demonstrate breadth and depth in chemistry					
2. Demonstrate effective oral and writing communication skills in chemistry	Oral presentation				
	Candidacy/Thesis manuscript				
3. Demonstrate ability to analyze data critically					
4. Demonstrate ability to conduct independent research correctly while abiding to ethical and safety standards	Project progress (see section II)				
		**TOTAL			

*Despite passing the exam, a score ≤ 5 in any SLO may require improvement and timely follow up at discretion of the committee.
**A total score ≤ 25 is deemed unsatisfactory and would prompt transfer to MS.

II. LIST OF PRODUCTS FROM THIS PROJECT BY STUDENT (SLO 4)

In presentations outside VCU: Oral_____ Poster_____

Or as primary (1st) or secondary (2nd) co-author in peer-reviewed journals: Published ____(___) Submitted____(____)

If this project in the hands of this student has no publication yet, what is the likelihood from 1 (low) to 10 (high) that this student gets primary co-authorship in a published article before the end of the 10th semester? _____

III. THE RESULTS OF THE EXAM WERE

SATISFACTORY (PASS) ☐
UNSATISFACTORY(NO PASS) ☐

Is a second meeting necessary? NO / YES When?_____Reason: UPDATE SLO # _____2nd TRY

IV. COMMENTS/JUSTIFICATION _____

NAMES AND SIGNATURES OF COMMITTEE MEMBERS INCLUDING DATE

Committee Chair: _____ Department of _____

Advisor: _____ Department of _____

Member: _____ Department of _____

Member: _____ Department of _____

Member: _____ Department of _____

Signature of Program Director _____ DATE_____

CURRICULUM MAP GRADUATE PROGRAM CHEMISTRY

					Goal 1 Establish expertise and communication skills in chemistry		**Goal 2** Demonstrate independent critical thinking in chemistry	
					Student Learning Outcomes			
		CREDITS	CATEGORY	COURSE/ REQUIREMENT	**1.1** Demonstrate breadth and depth in chemistry	**1.2** Demonstrate effective oral and written communication skills	**2.1** Demonstrate ability to analyze data critically	**2.2** Demonstrate ability to conduct independent research correctly while abiding to ethical and safety standards
AREA	Analytical	1.5	E	CHEM 630				
				CHEM 631				
				CHEM 633				
				CHEM 635				
				CHEM 636				
				CHEM 637				
	Physical	3.0	C	CHEM 510				
			E	CHEM 511				
				CHEM 512				
				CHEM 691				
	Organic	3.0	C	CHEM 504				
			E	CHEM 604				
				CHEB 601				
				CHEB 602				
		1.5		CHEM 506				
				CHEM 606				
	Inorganic	3.0	C	CHEM 520				
		1.5	E	CHEM 622				
Seminar & Writing		1.0		CHEM 690				
				CHEM 692				
				CHEM 698				
		3.0		CHEM 699				
Ethics & Professional development		1.0		CHEM 693				
		3.0		CHEM 696				
*Dissertation		1.0-10		CHEM 697				
		9.0		†HUMS 701				
‡CUMULATIVE EXAMS								
‡ORAL CANDIDACY EXAM								
THESIS DEFENSE								

C = Core, E = Elective; †Only for PhD candidates; ‡Only for PhD students
*Minimum dissertation credits for PhD = 32 of CHEM 697, or 32 of CHEM 697 + HUMS 701
*Minimum credits of CHEM 697 for MS-thesis = 9; for MS-non-thesis = 6
PhD = 9 C + 9 E = 18 didactic courses minimum
MS-thesis = 9 C + 6 E = 15 didactic courses minimum; MS-non-thesis = 9 C + 9 E = 18 didactic courses minimum

Request For Travel Funds
From Graduate Student Travel Program

Name_____ Date_____

Meeting_____

Dates of Meeting_____

Location of Meeting_____

Title of Paper_____

_____

Authors_____

_____

Type of Presentation (oral, poster, etc.)_____

_____

Amount Requested ($400 maximum during student's career)_____

APPROVAL

Research Advisor_____ Date_____
Signature

Graduate Director_____ Date_____
Signature

*This form must be submitted to the Graduate Director 4-6 weeks in advance of the meeting date

How to Dispose of Hazardous Waste

If you are using Hazardous Products or Materials, (flammable, corrosive, toxic, reactive) you are more than likely creating hazardous waste that needs to be disposed of properly.

Waste containers need to be compatible with what is being stored inside, especially the LID! A waste container is no good to anyone if the lid is corroded away by the hazardous waste inside

Storing Hazardous Waste

All waste containers need to be stored in some form of secondary containment (bucket, tray) in case of breakage)

While in Secondary Containment, each waste container needs to be labeled with the label below (labels available in Chemistry Stockroom)

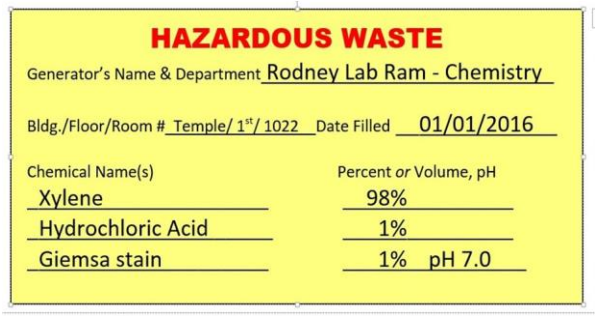
This does not have to be a complete and de-tailed list of what is inside the waste bottle, just a generic description, (Acidic, Basic, Organic Solvents) just so someone coming in the lab has an idea what is inside if they need to.

Waste bottles and the Secondary Containers need to be kept in a clean, neat, and segregated part of the hood. They need to be closed when not in use, no funnels left inside the bottles.

Final Labeling of Hazardous Waste,

Make sure the waste is labeled with the final label as seen below (labels available at link below VCU SRM under the forms heading)

https://srm.vcu.edu/i-want-to-know-about/waste-management/



Make Sure the label is filled out with the
Name of the Generator
Department
Building/Floor/Room Number
Date it was filled
Chemical Contents (NO ABBREVIATIONS)

Scheduling a Waste Pickup

Once all this filled out and taped securely on-to the waste bottle, visit the website below and follow the prompts for scheduling a pickup through VCU SRM

https://redcap.vcu.edu/surveys/? s=CNF7FWH4LE

All this information applies for both solid and liquid hazardous waste.