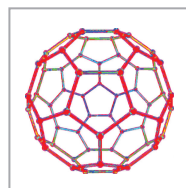
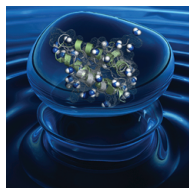
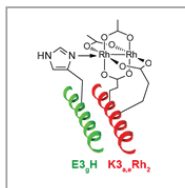
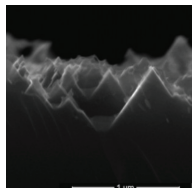
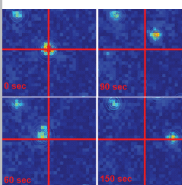
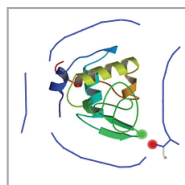
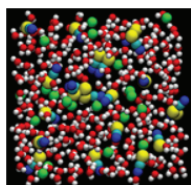
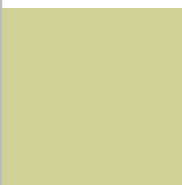
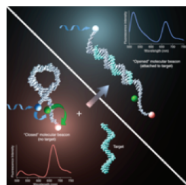
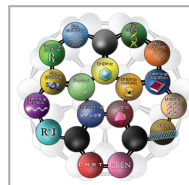
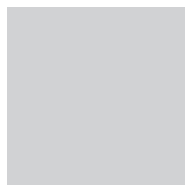
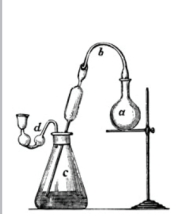
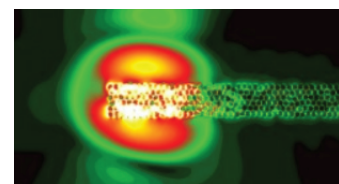
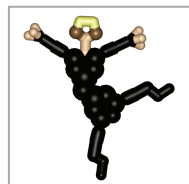
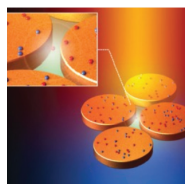
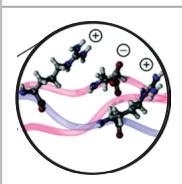


2014 - 2015



DEPARTMENT OF CHEMISTRY Graduate Program Handbook



Rice University
Department of Chemistry

Graduate Student Handbook

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2014-2015

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Department of Chemistry

About the Ph.D. in Chemistry

Welcome to the Rice University Department of Chemistry! The department encompasses those at Rice who investigate the composition, properties, structure and reactivity of matter. Among us are theorists and experimentalists, organic chemists and inorganic chemists, physical chemists and biological chemists, scientists and engineers. Rice is a terrific place to do research in chemistry. The department has developed two Nobel laureates and many members of the National Academy of Sciences.

For decades, the Rice culture has promoted interdisciplinary research. Most Rice chemistry professors have additional appointments elsewhere, including four of the five science departments and four of the eight engineering departments on campus. We have particularly strong programs in nanoscale science, theoretical chemistry, inorganic materials, experimental physical chemistry, biological chemistry, supramolecular chemistry and environmental chemistry. Rice University is a member of the Texas Medical Center, and the Chemistry department is at the center of important breakthroughs in nanomedicine.

Our graduate program is sharply focused on promoting the highest level of achievement for each Rice doctoral student. The program is highly selective, admitting only about 20 graduate students a year. These small numbers ensure that Rice graduate students have exceptional access to faculty time, instrumentation and other resources. As a consequence, chemistry graduate students at Rice develop unusually strong publication records. To ensure that financial constraints are not an obstacle, we waive the application fee for domestic students, and provide a generous stipend and full-tuition waiver for those students who enter our doctoral program.



Some Wisdom on How to be a Good Researcher

You are a junior colleague, not a lab assistant. You are learning how to conduct research, not just how to perform experiments or calculations.

Aim at becoming a creative, independent researcher, and strive to perform novel, creative research in the process.

Think critically: always question yourself, your adviser, your colleagues, and the literature.

Read the literature: first, capture the essence of articles, not the details; then, go back to the most relevant articles and look for details, if appropriate.

Set long-term research goals. What do you want to achieve? Why is it important? What will you and others learn from your research? How can you move towards your goals?

Set short-term objectives accordingly. Mountains are climbed one step at a time. How can you break the long-term goals into shorter-term objectives? How can you achieve the first few objectives? If you can't see a clear path, can you break down your objectives further?

Don't take shortcuts. Often, there is a right way and an easy way to solve a problem: they rarely coincide. Choose the right way over the easy way. Build each step of your research on sound foundations, the following steps depend on it.

Think creatively, and not only when you're in the lab. Think about your problem while you shower, while you cook, while you drive, before falling asleep. If you're too tired to think creatively, take a break with your friends or family, then get back at your problem!

Work hard and persistently: a good Ph.D. dissertation requires five or more years of dedicated work.

You, your advisor, and your colleagues are going into uncharted territory, thus, none of you can know where the dead-ends are. Making mistakes and meeting dead-ends is normal: overcome frustration, learn from mistakes, and improve!

Once you've thought hard about a problem, challenge your thinking with your colleagues, adviser, and other professors. Explain to them what you're trying to do and how, in both formal and informal settings. Don't be afraid to look stupid: the only people who have no stupid ideas are those who have no ideas! Listen critically to your colleagues' replies: is there any useful advice? Can they point you towards useful work in other areas you have overlooked? Do they know of methods, materials, theories, etc., that you can bring to support your problem?

Set high standards for yourself first, and then for your collaborators.

Rice University
Department of Chemistry

II. Administrative

A. Chemistry Staff Members

Chemistry graduate students are welcome to ask any of our staff for assistance at any time.

TITLE	NAME	PHONE EXT.	LOCATION	EMAIL (@rice.edu)
Executive Administrator	Mauricio Benitez	2895	SS 204	benitezm
Chemistry Store Manager	Carlos Cabello	3255	SS 219	ccabello
Shipping/Receiving <i>(packages)</i>	Javier Chavez	3257	SS 101	jjchavez
Storekeeper	Susan Cudnik	3275	SS 219	scudnik
Teaching Stockroom Manager	Ruxin Feng	3488	DBH 278	ruxin.feng
Department Coordinator <i>(postdocs, visitors)</i>	Gabriela Galvan	3277	SS 205	ggalvan
Undergraduate & Classroom Coor. <i>(undergraduates, CHEM 600 attendance, reserving rooms)</i>	Sofia Medrano	4027	DBH 342	smedrano
Seminar & Event Coordinator <i>(seminar speakers, reserving rooms, grad mail, facebook & website)</i>	Lori Meehan	4082	SS 201	ljm2
Research Accountant II	Virginia Morton	5864	SS 215	vmorton
Graduate Program Coordinator <i>(graduate questions, pay, reserving rooms, recruiting)</i>	Pam On (cell 832-629-6371)	5820	SS 203	pon
Facilities/Purchasing Coordinator <i>(keys & facilities)</i>	Abby Vacek	5402	SS 216	akv1
Lead Financial Administrator	Andrea Zorbas	4499	SS 214	zorbas

B. Graduate Stipends

Individuals paid on a semimonthly schedule receive a consistent amount of pay twice each month. Paychecks for GR employees are issued on the 15th day of the month and the last day of the month, or the previous business day if the pay date falls on a holiday or weekend. Each pay week in the semimonthly pay period runs from 12:01 a.m. Sunday until 12:00 midnight the following Saturday. If you have any questions regarding your stipend please contact Pam On.

C. Mail

Graduate Student Mail Boxes can be found in the hallway of SS 218. Please see Lori Meehan if you do not have a mailbox. Fed Ex and UPS Packages are received at the Space Science receiving dock.

D. ESTHER - Employee and Student Tools, Help, and Electronic Resources

ESTHER is the Rice University web application for students, faculty, and staff. Students will use this application to register for classes and retrieve certain data such as grades and account information.

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For information about how to use ESTHER see the PDF File "ESTHER presentation for students" (http://registrar.rice.edu/students/ESTHER_FAQs/)

Resources in ESTHER:

- Update your contact information
- Register
- Add, and drop courses
- View your course schedule
- Access your final grades
- View your unofficial transcript
- Obtain enrollment verifications
- Print your degree application
- View course & instructor evaluation comments for previous semesters
- Identify holds on your account
- View financial aid information
- View your employment information, such as your past pay stubs (if applicable)
- Review charges and payments
- Pay your account online
- Changes to forms (W4 & direct deposit information)

E. Student Health Insurance

Student Health Insurance: Rice University requires all degree-seeking students to have health insurance. Students electing to enroll in the Rice Student Health Plan may opt to be billed annually or semi-annually. Contact the Cashier's Office for payment options (713-348-4946). You must complete an insurance waiver form to waive your enrollment in the Rice Student Health Plan.

Health Data Form (HDF): ALL new undergraduate students and graduate students are required to submit a properly completed Health Data Form (HDF) to Student Health. All students under the age of 30 years, regardless of classification, must provide documentation of vaccination against meningococcal disease. (<http://health.rice.edu/Content.aspx?id=101>)

F. Graduate Studies Form Library

Graduate Studies keeps a very useful library of commonly needed forms for everything from leave of absence to candidacy petition to thesis submission. They can be found at <http://graduate.rice.edu/forms/>

Specific forms include:

Enrollment

- Leave of Absence
- Short Term Medical and Parental Leave
- Withdrawal (a statement of withdrawal is also required)

Registration and Transfer Credits

- Registration forms can be found at the Office of the Registrar's website
- Transfer Credit forms are available through the Office of the Registrar

Candidacy

- Candidacy Petition Instructions
- Master's Candidacy Petition
- Doctoral Candidacy Petition
- Request for Extension of Time to Candidacy

Thesis Defense

- Thesis Defense Instructions

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- Electronic form for announcing your defense as required by the General Announcements
 - Request for Extension of Time to Defense
- Thesis Submission
- Thesis Submission Instructions
 - Master's UMI Agreement Form
 - Doctoral UMI Agreement Form
- Degree Conferral
- Registrar's Application for Degree (All degree candidates)
 - Petition for a Non-thesis Master's
 - Petition for an Automatic (or Candidacy) Master's
 - Graduation Checklists
- Commencement

G. Applying for a Social Security Number

Generally, international students are eligible to apply for a social security number towards the end of their first year. Social Security Number Procedures for F-1 and J-1 Students can be found at <http://oiss.rice.edu/content.aspx?id=102>

To be eligible, the student must meet *all* the following requirements:

- Student is on F-1 visa status.
- Student is currently enrolled full-time.
- Student has secured employment, i.e. on-campus job, off-campus CPT/OPT, research assistant or teaching assistant in academic department (*fellowships are not considered employment*).
- Student has been in United States for more than 10 days.
- Student has been registered as a full-time student in SEVIS.

If all requirements have been met, please follow these procedures:

- Request department supervisor where you are employed to complete "Employer Verification Form", available in OISS or on-line at <http://oiss.rice.edu/content.aspx?id=102>. Once completed, give form to OISS to complete SSA Letter of Support.
- Take I-20, I-94, passport, employer letter, and OISS letter to SSA office. Maps to SSA office are available in OISS, or you may look up SSA offices at: <http://www.socialsecurity.gov/locator/>

Once you receive your Social Security Number, go to Payroll to submit your information.

H. First Year International Students – Mentoring Program

The Chemistry Department is beginning a new peer mentoring program to assist first year international students in a smooth transition to Houston, Rice, and the Chemistry program.

A list of current graduate students is available to help answer incoming international student's questions. Mentors would assist the first year students in academic matters, Houston sites/diners, Esther, lab questions, and other questions. Please note that mentors are not responsible for any matters that are outside the scope of basic questions.

Incoming international students can view a list of current graduate students who can assist them at:


https://docs.google.com/a/rice.edu/spreadsheets/d/1JX3PU4jUVENXRg-PY04avfKP3BRf9oX9_5omUNRg5uc/edit#gid=604689657

or contact Pam On (pon@rice.edu) for additional information.

Rice University Department of Chemistry

J. 2014 – 2015 Chemistry Graduate Student Association (CGSA)

POSITION	NAME	CELL PHONE	LOCATION	EMAIL (@rice.edu)
President	Anneli Hoggard	801-885-0164	DBH 100B	anneli@rice.edu
Vice-President	Sam Gottheim	914-523-3639	Brockman 223	sg38@rice.edu
Secretary	Brittany Oliva-Chatelian	504-460-7289	DBH 410	boliva@rice.edu
Treasurer	Paul Derry	214-491-0695	BRC 323	pjd3@rice.edu
GSA Representative	Andrea Miranda	832-293-3819	SST 120E	alm9@rice.edu
Speaker Coordinator	Yufan Zhang	281-630-7873	SST120	yufan.zhang@rice.edu
Inventory Controller	Steve Sanchez	630-272-8950	SS 110, 111-A	ss76@rice.edu
Lounge Manager	Yara Kadria-Vili	832-275-0132	SS 111	yk22@rice.edu
Webmaster	Yao Cui	832-499-1256	BRK 327	yc32@rice.edu
Industry Coordinator	Amanda Goodman	515-720-1424	Brockman 234	amj10@rice.edu
Alumni Coordinator	Andrea Schlather	713-283-0023	DBH150/BRK 235	aes5@rice.edu



The CGSA is a group dedicated to the service of chemistry graduate students at Rice. We plan parties, monthly happy hours, and outings. We act as a liaison between graduate students and the department. We give awards, coordinate with other GSAs and generally make the Chemistry department a great place for grad students.

Explore our new website!

<p>C</p> <p>Calendar</p> <p>12,0107</p>	<p>O</p> <p>Officers</p> <p>15,9994</p>	<p>P</p> <p>Photos</p> <p>30,973762</p>
<p>Ho</p> <p>Houston</p> <p>164,93032</p>	<p>Re</p> <p>Research</p> <p>186,207</p>	<p>Li</p> <p>Links</p> <p>6,941</p>

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HTML | CSS

Webpage: <http://python.rice.edu/~cgsa/index.html>

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III. General Announcements

Rice University publishes its "General Announcements" each year. These are the official rules of the university and can be found at <http://ga.rice.edu/>. The section titled "Graduate Students" outlines the basic rules and expectation for all graduate students at Rice University. Students must be in agreement with the General Announcements and the Code of Conduct found at http://students.rice.edu/uploadedFiles/Students/Dean_of_Undergraduates/Code_of_Conduct/2013-2014_Code_of_Student_Conduct.pdf

While all students are bound by these minimum requirements, many programs, including the Ph.D. in Chemistry, have additional requirements. The second portion of the General Announcements of importance is the section specific to the Department of Chemistry which can be found at <http://ga.rice.edu/programs.aspx?FID=2147483679>. This section details all the basic requirements for earning a Ph.D. in Chemistry. This section from the 2013-2014 general announcements is reproduced below:

Degree Requirements for MA and PhD in Chemistry

For general university requirements, see Graduate Degrees (http://ga.rice.edu/GR_degrees/). Students who have completed course work equivalent to that required for a BA or BS in chemistry may apply for admission to the PhD program. For more information, see Admission to Graduate Study (http://ga.rice.edu/GR_admission/). Students are not normally admitted to study for an MA degree.

Requirements for the PhD in Chemistry

Research—The PhD in chemistry is awarded for original research in chemistry. During the first semester of residence, students select a research advisor from among the members of the faculty. In some cases, students may choose research advisors outside of the department. Approval of the department chair is required to formalize these advising relationships. The research advisor will guide the student in the choice of an appropriate research topic and in the detailed training required to complete that project. Students must successfully complete CHEM 800 *Graduate Research* and CHEM 600 *Graduate Seminar* every semester of residence. Candidates earn a PhD after successfully completing at least 90 semester hours of advanced study in chemistry and related fields, culminating in a thesis that describes an original and significant investigation in chemistry. The thesis must be satisfactorily defended in a public oral examination. The student must pass the thesis defense before the end of the 16th semester of residency.

Coursework—Within the first two years, the student must complete six 3-semester-hour graduate-level lecture courses at Rice University, or their approved equivalent. In order to satisfy this requirement, each of these courses must satisfy the following criteria:

- They must be approved by the department's graduate advising committee.
- Chemistry graduate courses must be at the 500 level or higher. Certain 300- and 400-level courses in other departments may be acceptable with prior approval by the department's graduate advising committee, but a maximum of three lower-level courses in other departments can count towards the six-class requirement, and these do not count towards the university-wide requirement of 90 credits at the 500 level. Courses must be in technical subjects in science or engineering. Courses in teaching, presentation, or management will not be counted toward the six-class requirement. Each course must be passed with a grade of B- or higher. It is possible to repeat or replace a course, upon approval of the department's graduate advising committee. A maximum of two courses can be repeated/replaced.
- Students who pursue both the BS and the PhD at Rice need not duplicate course work for the two degrees. However, teaching as an undergraduate does not substitute for the teaching requirements in the PhD program.

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Responsible Conduct of Research—Each graduate student must successfully complete the ethics course UNIV 594.

Teaching—Each graduate student must participate in teaching (CHEM 700) for the equivalent of three semesters. Assignments are determined by departmental needs.

Qualifying Examination—The qualifying exam has written and oral components, and the expectations for these are available in the department office. The examination committee will be composed of three faculty members, excluding the research advisor. The written document must be submitted to the committee at least one week before the date of the oral examination. The examination must be taken by the last day of class at the end of the student's fourth semester in residency. Any follow-up work required by the committee must be completed by the assigned date, and the exam must be passed by the end of the sixth semester.

Advancement to Candidacy for the PhD—After completing the required coursework, teaching, and qualifying examination, a student must petition to be advanced to candidacy for the PhD degree. Upon advancement to candidacy, a student chooses a thesis committee of at least three faculty members with the guidance and approval of the research advisor and department chair. The thesis committee must include one faculty member whose primary appointment is outside of the chemistry department.

Requirements for the MA in Chemistry

MA Program—Although students are not normally admitted to study for an MA, graduate students may earn the MA after obtaining approval of their candidacy for the PhD. The MA degree may also be earned by students who do not achieve PhD candidacy by:

- Completing the six one-semester courses required for PhD candidacy
- Producing a Master's thesis that presents the results of a program of research approved by the department
- Passing a final Master's thesis defense and submitting the thesis to the Office of Graduate and Postdoctoral Studies.

Satisfactory Performance

University guidelines states that to graduate, students must achieve at least a B- (2.67) GPA in each course counted towards the graduate degree. Some programs and departments have more stringent standards. To remain in good standing in the Chemistry Department, a student must maintain a GPA of 3.00 (B) or higher in all lecture courses, a GPA of 3.00 (B) or higher in all semesters of CHEM 700, and a grade of B or higher in every semester of CHEM 600 and CHEM 800. Failure to maintain satisfactory grades and sufficient progress in research will result in probation and possible dismissal.

The student must be enrolled full time in a departmentally approved research group beginning the second semester, and every semester thereafter.

All graduate students are evaluated annually to ensure that they are making appropriate progress towards the degree. The student, advisor, or department may request a meeting between the student and a faculty committee at any time to evaluate progress or to determine a course of action. If progress is unsatisfactory, the committee may recommend a semester of probation, which could result in dismissal from the program if progress remains unsatisfactory in the probationary semester.

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Department of Chemistry

Appeal

Students may petition the Chemistry Department Graduate Advising Committee for variances on these academic regulations.

IV. Program Protocol

A. Changing Laboratories / Advisors

Changing advisors can be a serious disruption to a student's timeline toward a Ph.D. A student consequently requires the approval of a Committee on Advisor Changes to move from one research group to another. After a student has joined a research group, either the student or the advisor might determine that this match is not suitable. Students must have a research advisor to remain in good standing. A student is *required* to find a new research advisor to continue in the program if:

- S/he has received a grade of B- or below in CHEM 800 for two consecutive semesters
- S/he been removed from the lab of his/her advisor.
- A student may *elect* to leave his/her research group based on research area, perceived mismatch in student / advisor personality or other irreconcilable differences (a student who is considering changing advisors should consult with the Director of Graduate Studies).

Regardless of the reasons the original student / advisor relationship has ended, the case is referred to a Committee on Advisor Changes.

Committee's Responsibilities:

- 1) Determine whether it is appropriate for a student to try to find a new lab and stay in the program, or if the student should depart from the program.
- 2) If the student is approved to look for another lab, the committee must decide how long the student has to find a new advisor and recommend whether it would be appropriate to provide any bridge resources to support the student while s/he is not affiliated with a lab. The department chair will formally be the student's advisor during any time the student is between labs, and will submit grades or other evaluations of the student.
- 3) If the student finds an advisor willing to support him/her, the committee will determine if this particular student / advisor match has sufficient promise to go forward. The committee may solicit letters from i) the student, ii) the previous advisor, and iii) any potential new advisor(s). The committee may also ask the student to make a presentation on research achievements with the previous advisor, likely research projects with the proposed advisor, reasons for moving, or anything else relevant to the case in question. If the committee does not gain adequate confidence that changing advisors will lead to a positive outcome, the student will not be allowed to continue in the program. Generally speaking, the fewer years that the student has been with his/her original advisor the more favorable the outlook of the committee will be. Transfers during a student's first year are relatively common and usually due to student / advisor mismatch while a transfer after advancement to candidacy suggests a major setback in a student's time line to graduation and typically significant problems with the student in question.
- 4) If a student changes advisors prior to achieving candidacy, the committee, in consultation with the new advisor, will determine a reasonable time line for the qualifying exam to be completed. In some circumstances it may be more suitable to have the student defend a Master's thesis.
- 5) A student who changes advisors after achieving candidacy will join the new lab on research probation (regardless of his/her previous status). This probation must be resolved by a meeting with the thesis committee at the end of the first semester in the new lab, in which the student must convince the committee that the transfer has been successful. If a student

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changes advisors early in graduate school, the qualifying exam will serve as the evaluation for whether the transfer has been successful.

B. Primary Appointment is Outside the Chemistry Department

The department of chemistry has many faculty members whose primary appointment is in another department but who have a joint appointment in chemistry, all these faculty are also listed on the department webpage. Students are permitted to choose these faculty members as their primary research advisor without any special permission. Student's, however, are not free to choose faculty members without an appointment in chemistry except under very rare circumstances and this require approval from both the chair of graduates studies as well as permission of the department chair.

C. Course Requirements

1) Lecture Courses

To advance to candidacy every student must successfully complete a minimum of 6 lecture course equivalents (3 credit courses count as 1 equivalent while 1.5 credit courses count as 1/2 of an equivalent) in advanced chemistry or other math, science or engineering courses. The grade point average for these six courses must be 3.0 or greater and only classes with a grade of B- or better will count toward the requirement. Recently the Department of Chemistry has also begun offering half semester courses. Two of these, and some select half semester courses from other departments, can be combined to count toward the 6 lecture course requirement.

Some students may come to Rice having already completed advanced work at another institution and may qualify to have one or two courses of the six course requirement waived (see course waivers below). The department allows a great deal of flexibility in what courses fulfill this requirement. However, to qualify, courses in chemistry must be of the 400 or 500 level. In some instances courses outside the Department of Chemistry at the 300 level may count toward the 6 course requirement. *All courses taken outside of the Department of Chemistry require the written approval of the chair of graduate studies and your Ph.D. advisor qualify for the 6 course requirement.*

Courses that **do not** qualify towards the six course requirement include: courses in management, administration, seminars, and teaching courses. This does not mean that you cannot or should not take these courses, only that they do not count towards the requirement. There are many instances in which it may be important and desirable to take such courses and, with agreement from his or her research advisor, the student is encouraged to take these classes. *If you have any doubt about whether a particular course counts towards your degree or not, please contact Professor Hartgerink, Chair of Graduate Studies, (jdh@rice.edu) for clarification.*

2) CHEM 600, Chemistry Seminars

Chemistry grad students are required to register for a section of CHEM 600 each semester (including the semester the thesis is defended). Each semester you must:

1. Attend a minimum of **8 one-hour student seminar sessions** in any CHEM 600 section. These typically have two speakers, but sessions that have only one speaker because of scheduling problems count. Qualifying exams and thesis defenses have a single speaker but count towards the 8. The master schedule is the public "CHEM 600" Google calendar on the departmental web page. It is recommended that students subscribe to this calendar which can be done from the link below or contact Sofia Medrano (smedrano@rice.edu) if you are unable to link to the file. Also, contact Sofia to be linked to the CHEM 600 attendance file.

<https://www.google.com/calendar/feeds/ricechem600%40gmail.com/public/basic>

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Note that occasionally a meeting will be at an unusual time. Summer 2014 thesis defenses can count for Fall 2014 CHEM 600. Most talks will be in DBH180, but some will be in other places (as described on the CHEM 600 calendar). Note that in the Fall of 2014 Tuesday talks will generally be in BRC.

- Attend a minimum of **6 chemistry department seminars** of your choice. The seminars that qualify are compiled in the public "CHEM seminars" Google calendar. It is recommended that students subscribe to this calendar as well:

<https://www.google.com/calendar/feeds/ricechemseminars%40gmail.com/public/basic>

Summer 2014 departmental seminars (if any) can count for Fall 2014 CHEM 600. Seminars elsewhere do not count; 6 seminars/semester is so few that there's plenty of flexibility to attend seminars in other departments without decreasing participation in chemistry seminars.

- Present a seminar according to the following schedule:

Year	Fall Semester	Spring Semester
1 st		background and preliminary results
2 nd	practice Q exam	qualifying exam
3 rd		research progress
4 th and higher	research progress	

If you are a student who began during a Spring semester (January) instead of the normal Fall semester (August), your presentation dates will be offset by one semester. Please make sure that you notify the faculty member running your section of your timing so that an accurate schedule can be made at the beginning of the semester.

CHEM 600 Grades

Grades for CHEM 600 are determined by two factors: the quality of research and the presentation given each year and attendance in the above mentioned student and departmental seminars. If you are not required to present during a given semester, you begin with an "A". If you have presented during a given semester the instructor for the section will assign an initial grade based on your research progress. These initial grades are then modified by your attendance: Each shortfall of a CHEM 600 session or a departmental seminar is penalized two fractional letter grades (e.g., A to B+). Substitutions between categories are not allowed (e.g., 9 student seminar sessions + 5 departmental seminars = B+). A grade of B or higher is necessary to maintain good standing in the department. A grade of B- will place you on probation. Two probationary events over the course of your PhD may result in your expulsion from the program.

Expected attendance of student talks and department seminars may be prorated for students who graduate during the semester (e.g., someone who graduates at midterm need do only 4 + 3 to get an A). Adjustments will be made for students whose classes conflict with seminars more than twice a week. It is possible that during a particular semester you will be unable to attend CHEM 600 due to research demands at another location (for example, an internship) or other interruptions of your normal schedule. Arrangements can be made with Prof. Hartgerink before the semester begins to come to a logical solution to the problem through written or other substitute work. ***Any prorating arrangements must be made at the beginning of the semester. No negotiations on grading and attendance proration will be made at the end of the semester.***

If you are presenting in a given semester you must send a brief (three pages or less) research update to the CHEM 600 section instructor that highlight your total research accomplishments to date highlighting research accomplishments since your most recent CHEM 600 presentation.

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Include in this any publications and presentations, and any substantial accomplishments or challenges you face. Conclude by stating whether you would like to schedule a thesis committee meeting to discuss any problematic situations.

Your research advisor must write a letter of evaluation which should be sent to the CHEM 600 instructor and to Pam On (pon@rice.edu) before the date of your presentation. It is in your best interest to remind your advisor to send this letter.

Your thesis defense can count for your CHEM 600 talk if it's done in the semester that you are scheduled to present. If you are certain that you'll defend in a given semester, you may cancel your regular CHEM 600 talk that semester. However, if you end up not defending that semester, you will have skipped your talk and will not pass CHEM 600 that semester.

Each presentation will be approximately 20 min long followed by 5 min of questions. The qualifying exam may be 30-45 min long followed by questions. Concentrate on the experimental design and results that you obtained *yourself*. The 1st year talk may be largely from literature, but for other talks only ~5 min of the talk should be of an introductory nature.

Please be sure to show appropriate respect to the speakers. During CHEM 600 and departmental seminars, laptops may be used only to take notes on the talk. The user should alert the speaker(s) beforehand that s/he will be using a laptop to take notes and should sit in the first or second row so that the audience can see that the computer is being used for an appropriate purpose. Please alert Prof. Matsuda if you become aware of any incidents in which this policy is not sufficiently effective. Arriving late is disruptive, and isn't fair to either the speaker who's trying to concentrate, or to the audience who arrived on time. CHEM 600 instructors will collect the sign-in sheet as soon as the first presentation begins. *"Better never than late"— George Bernard Shaw*

The above are the minimum guidelines for all sections of CHEM 600. Each semester the faculty member running your section of CHEM 600 may **add** requirements which you will be obligated to follow, but will never reduce any of the above requirements. Any additional requirements will be communicated to you during the first session of that section.

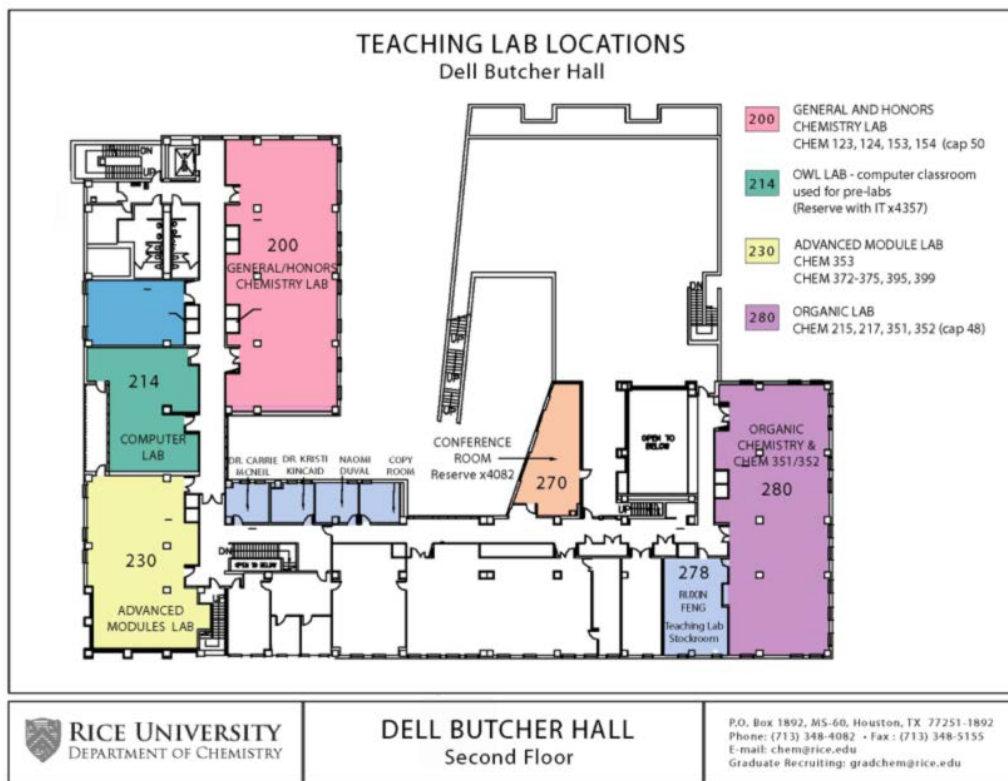
3. CHEM 700, Teaching Practicum

All graduate students are required to complete an equivalent of three teaching units through the CHEM 700 Teaching Practicum course. This course focuses on providing the tools necessary to effectively teach chemical concepts to undergraduate students, primarily in a teaching lab setting.

Outside of lab-specific responsibilities (given by lab instructor), additional formal teaching training will be used to provide useful tips and techniques that can be employed while teaching, as well as to assist students in oral and written communication. This training will meet weekly during the fall semester and will assist students in designing short multimedia presentations and effectively providing feedback on undergraduate students' written assignments. The time commitment for CHEM 700 is 8-10 hr/week over a 16-week period (the week before classes formally begin to the week after the last class, 128-160 hr total). Some assignments (such as lab modules) are designated as half-courses (64-80 h total) because they demand less TA time (although modules may have as many in-class hours as the general chemistry and organic labs, they typically require little or no time outside of lab). Because CHEM 700 is always taken for 2 credit hours whether a full or half course is taught, the number of CHEM 700 credit hours is not indicative of the number of teaching units the student has taught. The tally of teaching units is kept by the department office and is distributed annually.

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4. Chem 800, Graduate Research

For your first semester at Rice your grade in CHEM 800 will be determined by your participation in the faculty introductory talks and your three lab summaries. You can still get an A in CHEM 800 if you miss one faculty presentation; however, every presentation you miss after this will reduce your grade by two fractions of a letter grade (*i.e.* A to B+, B+ to B-, etc.). Additionally your grade will be reduced by two fractions for every day your lab summaries are late. In short, everyone should receive an “A” in CHEM 800 their first semester if they are diligently researching their options for research.

After you have joined a lab your advisor will assign your letter grade based on your progress in research for the remainder of your time at Rice. A grade of B- or worse results in the student being placed on probation. Please note that any grade below an “A” should be a concerning and you are recommended to discuss with your advisor why you received the lower grade and what you can do to improve it. Two semesters of poor performance (B- or below) will in most cases result in the student being removed from the Ph.D. program.

★ You must register for CHEM 800 for summer sessions to remain a full time student.

D. Course Waivers

Students are normally required to successfully complete 6 lecture courses (or their equivalent) in Chemistry or courses which are pertinent to their thesis objectives (Chemical Engineering, Bioengineering, Biochemistry, Physics, etc.). In some cases students start their Ph.D. program after already completing substantial graduate course work. Often this is in the form of a Master’s degree from another university. These students have the opportunity to apply for a maximum of two course waivers which reduce their

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course requirements to 4 or 5 classes depending on the number of waivers granted. Application for course waivers can be done after one semester of course work at Rice has been completed.

Consideration of the waivers will be based on (in order of importance):

- 1) Success in course work at Rice. In most cases, students must have received all A's or A-'s to receive waivers.
- 2) Success in course work previous to Rice which is comparable to course work offered at Rice. For example, receiving an A in Advanced Organic Chemistry at Texas A&M might qualify a student for a course waiver for CHEM 401 Advanced Organic Chemistry here at Rice.

If you feel that you qualify for one or more waivers, you must make this request to the Chair of Graduate Studies (currently Professor Hartgerink) along with: a) your Rice grades b) your grades from your previous institution, and c) the syllabus from the previous course which you feel would substitute for a Rice course.

E. Annual Evaluation

Students are evaluated each year. First year students are evaluated based on success in joining a laboratory, completion of course work and TA assignments. This evaluation is carried out by the Chair of Graduate Studies and no written document is required from the student or provided to the student unless deficiencies are noted.

Second year students are evaluated based on their performance on their qualifying exam by a committee of three faculty members. A written evaluation is provided to the student by the chair of the committee.

Third year and older students are evaluated based on their presentation in CHEM 600 and will also result in a written evaluation. The evaluation will be performed by the CHEM 600 instructor with input from the student's advisor and any other faculty participating in that section of CHEM 600.

F. Time Away

Graduate school is a full time, 12 months per year occupation. Graduate students are expected to coordinate and obtain approval for any time away with their research advisers sufficiently far ahead of time to avoid any conflicts.

G. Probation and Dismissal

Students may be put on probation for a variety of reasons including, but not limited to, the following:

- 1) GPA of lecture courses being below 3.0
- 2) Earning a grade of B- or less in CHEM 600, 700 or CHEM 800
- 3) Failing the qualifying exam

Upon being placed on probation, you will receive an email stating the reason you were placed on probation which will be copied to your research advisor and placed in your permanent file. Your first offense is only a warning. However, if you are placed on probation a second time, you will be dismissed from the Chemistry Ph.D. program unless your research advisor petitions the department to request you be allowed to continue in the program. If your advisor makes this request, a full faculty vote is required as to whether to keep you in the program or not.

☆ Please note, if you do particularly poorly in one semester of lecture courses this may be in practice extremely difficult to improve your GPA back to an acceptable 3.0 or better in the following semester. Even if your second semester grades are better than 3.0, if your total GPA is still below 3.0 this would qualify as a probationary event. Because of this, you are strongly urged to consider your course selection and load carefully at the beginning of the semester as well as before the drop deadline to avoid impossible situations.

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H. Conflict Resolution

During the course of your Ph.D., it is possible that you may have a conflict with your research advisor over issues concerning your rate of progress, time to complete your degree, graduation or other scientific issues. While it is best to resolve these problems independently, there are many instances in which it is beneficial to have additional input. At any time a student, his/her advisor or an evaluating CHEM 600 instructor can call a thesis committee meeting to help resolve whatever the conflict might be. In such a meeting the student will make a brief presentation of research progress to his/her committee consisting of the research advisor plus two additional faculty members.

I. Reduction or Termination of Financial Support

Students who are not making adequate progress in research or who have been placed on probation for other reasons may have their financial support removed and may also be removed from the chemistry Ph.D. program.

J. Graduate and Postdoctoral Studies Guidelines for Academic Probation, Dismissal, Petitions, and Grievances

Please refer to the Department of Graduate and Postdoctoral Studies website for university guidelines for academic probation and dismissal, petitions and appeals, and grievances and problems located at http://ga.rice.edu/GR_policies/.

IV. Typical Timeline for a Ph.D. Student

Year 1

The most important objective of the first year is to secure placement into a laboratory (typically done near the end of October).

In the first year, most students complete:

- 6 lecture courses in advanced chemistry or other math, science or engineering discipline
- 1 or 2 units of teaching
- Give their first CHEM 600 presentation during the second semester

Year 2

The primary objective of the second year is to complete the qualifying exam and advance to candidacy.

- Any required lecture courses not completed in year 1 must be completed before the end of year 2.
- The 3 units of teaching must be completed by the end of the third year, but most students complete these by the end of year 2.
- CHEM 600 presentations are made both semesters in the second year. The presentation in the second semester of the second year is the Qualifying Exam. At the end of the second year many students will have published their first paper. All other students should be near the submission of their first paper or should have made major progress towards this goal.

Year 3 and Beyond

With most of the requirements of the Ph.D. behind you, almost all of your energy should now be focused on research towards your Ph.D. defense.

While the rate of publication varies from discipline to discipline and from lab to lab, the best way to measure your progress towards this goal is by the quality and quantity of publications.

- Graduate students in the third year and higher must continue to participate in CHEM 600 every semester they are enrolled as a student in the chemistry Ph.D. program.
- Give an oral presentations in the spring semester (3rd year) or fall semester (4th year and above). See CHEM 600 guidelines for details.

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Graduation

The required time to complete a Ph.D. depends on many variables including the type of project you are working on, how hard you work, how smart you are and, many times, how lucky you are. However, most Rice students will graduate with a Ph.D. in 4-6 years with 5 years being the most typical.

The last hurdle you face as a student will be to write your thesis and publicly defend it in front of a committee of at least three faculty members, one of which must be your Ph.D. advisor and one of which must be a Rice faculty member who has a primary appointment outside the Department of Chemistry.

More detailed information can be found in the sections below.

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V. Your First Year

A. Early Matriculate

Some students will come to Houston early (between May 16 and August 15) to work in a lab over the summer. This is a way to get a head start on picking an advisor during a time when you do not have all of the distractions of course work and teaching assignments. During this time you will be paid at the existing stipend rate, which also means that the professor that you work for will be paying you. In order to do this, you will need an agreement that the particular faculty member is willing and able to support you during this time. The Chair of Graduate Studies or the department chair can help you find a suitable match if you ask.

It is important to realize that by working for this faculty member during the summer neither you nor the professor you work for is committed to a long-term relationship. Both of you are given the opportunity to determine if the relationship is positive. You may find that the science, lab atmosphere and personality of the professor you have chosen are exactly what you are hoping for in a Ph.D. On the other hand you may find that some aspect of that lab is not what you had hoped. Similarly, the professor may find that you are exactly the kind of intelligent, hard-working student that he / she is hoping to recruit, or he / she may not. If it works out for both parties, you are well on your way to choosing a lab for your Ph.D., if it does not work out, you have gained valuable experience and still have the full, normal amount of time to select an advisor.

B. O-week and Registering for Courses

Your first semester at Rice will begin with Orientation Week (or O-week) during which you will learn the basics about Rice and the Department of Chemistry. The major events of O-week will include presentations by many of the faculty interested in recruiting students this year. This is a good way to make your first contact with faculty if you did not participate in summer research.

Faculty advisors will review your background and assist you in selecting courses for your first semester at Rice. Most students will select three 3-credit advanced chemistry or other science lecture courses in addition to UNIV 594 (Responsible Conduct of Research), CHEM 600 (1 credit, the Chemistry Seminar Series), and 800 (variable number of credits, Graduate Research).

The majority of incoming students will also teach their first semester and therefore be enrolled in CHEM 700 (2 credits, the Chemistry Teaching Practicum). There will also be a special information session regarding your teaching assignment during orientation.

- **Registering For Courses:**

To be a full-time student and receive a stipend, you must be enrolled in a minimum of 9 credit hours every semester (6 credit hours during the summer session). To ensure that students remain full-time even after dropping a class or even two, a student should be enrolled in at least **15** credit hours every semester. A variable number of credit hours of CHEM 800 (Graduate Research) should be added such that the total credit hours equal at least 15.

Six example schedules for your first semester are shown below:

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3 Lectures, No TA			3 Lectures & TA		
CHEM 401*	3	This is the most common schedule for a first semester graduate student.	CHEM 401*	3	This is the second most common schedule for a first semester graduate student.
CHEM 547*	3		CHEM 547*	3	
CHEM 442*	3		CHEM 442*	3	
UNIV 594	1		UNIV 594	1	
CHEM 600	1		CHEM 600	1	
CHEM 800	4		CHEM 700	2	
			CHEM 800	2	
Total Credits	15		Total Credits	15	
2 Lectures & No TA			2 Lectures & TA		
CHEM 401*	3	Students who feel they may be especially challenged their first semester or who feel that the offered courses are particularly unsuited to their needs may elect to take only two lecture courses, however in this case where no TA duties are assigned the student should be especially aware that they are leaving a great deal of work for later semesters.	CHEM 401*	3	Students who feel they may be especially challenged their first semester or who feel that the offered courses are particularly unsuited to their needs may elect to take only two lecture courses.
CHEM 442*	3		CHEM 442*	3	
UNIV 594	1		UNIV 594	1	
CHEM 600	1		CHEM 600	1	
CHEM 800	7		CHEM 700	2	
			CHEM 800	5	
Total Credits	15		Total Credits	15	
4 Lectures & No TA			4 Lectures & TA		
CHEM 401*	3	Students with particularly good preparation coming to Rice may elect to take 4 lecture courses. This option is particularly viable since the student will have no TA duties and is advantageous as your later semesters will be more free for research. However, students should note that it is far better to earn three A's than it is to earn four B's (or worse). Be prepared to drop one of your classes if the work load is too much.	CHEM 401*	3	Students with particularly good preparation coming to Rice may elect to take 4 lecture courses. This is advantageous as your later semesters will be more free for research. However, students should note that it is far better to earn three A's than it is to earn four B's (or worse). Be prepared to drop one of your classes if the work load is too much.
CHEM 547*	3		CHEM 547*	3	
CHEM 442*	3		CHEM 442*	3	
CHEM xxx	3		CHEM xxx	3	
UNIV 594	1		UNIV 594	1	
CHEM 600	1		CHEM 600	1	
CHEM 800	4		CHEM 700	2	
			CHEM 800	2	
Total Credits	18		Total Credits	18	

**Note: the 4xx and 5xx level course shown here and elsewhere on this table are arbitrary and for example only*

- You must also register for CHEM 800 for the summer session to remain a full time student.
- In your 5th and later semesters your schedule might look like this:

Course	Credits
CHEM 600	1
CHEM 800	14

The changing number of credits of CHEM 800 is indicative of the transition from a mixed emphasis on coursework and research towards total dedication to your research.

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C. UNIV 594, Responsible Conduct of Research Requirement

All students are required to register for UNIV 594 "Responsible Conduct of Research" during their first semester as a student. Responsible conduct of research (RCR) is defined as the practice of scientific investigation with integrity. It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research.

D. Adding Courses / Dropping Courses

Adding and dropping courses near the beginning of a student's first semester *requires the signature of the Chair of Graduate Studies in Chemistry (currently Professor Hartgerink)*. Dropping courses after the drop deadline (typically the 10th week of the semester) is usually **not** permitted.

E. Joining a Lab

The department is ultimately responsible for each student's education, and faculty members cannot unilaterally admit students into their labs. Students join labs through a three-way agreement with a faculty member and the department.

Students are not committed to any labs during a shopping period that runs from matriculation to midterm of the fall semester. The lab-joining process is initiated by the student, who should submit to the Graduate Program Coordinator (Pam On) a hard-copy, ordered list of three labs in which s/he is interested by the end of the shopping period (**5 pm, Friday Oct 10th 2014**, before midterm of the fall semester). The faculty will be informed of the choices, and a faculty member listed as a student's first choice may then accept that student if the department approves. If necessary, similar processes will place students in their second choice (or in very rare cases, a lower choice lab). Any extra-departmental agreements are meaningless. If a student and faculty member were to make a private agreement to work together and one party then discovered an undesirable trait in the other before the departmental approval, it would be best for everyone to seek other partners. Where a student worked over the summer or had a desk during the shopping period is immaterial to the lab-joining process; neither student nor faculty member have any obligation to continue the relationship.

Research during shopping period is allowed but not encouraged. It is only 7 weeks and students are busy, so it's very unlikely that students will achieve anything substantial. Faculty should not pressure students to do experiments during the shopping period to assure / permit admittance. Students should inform the chair if they feel pressure.

It is essential that students learn as much as possible about many labs. To facilitate this process, each student must submit three one-page summaries, each of which describes her/his investigations into one of three different labs (including that of at least one assistant or associate professor). These will be spaced throughout the shopping period (due **September 5, September 19, October 3**) to keep students engaged in the shopping process. Each should cover a paper from the lab, a group meeting, or an ongoing project discussed with the professor or a lab member. By that time the student should also attend at least one group meeting (if this is not logistically possible, meet individually with lab members) and have a personal meeting with the professor. By 5 p.m. of the due date, the document should be emailed to Ms. On, Professors Hartgerink and Pasquali, and the professor whose lab was reviewed (who should alert Professors Hartgerink and Pasquali if the one page description is not adequate, the student did not attend a group meeting or an equivalent, or s/he did not have a personal discussion with the student). The onus is on the student. Students who don't use this process to convince the faculty that they have thought carefully about three options by October 10th will be assigned a lab later in the semester.

- To summarize you will need to write **three** one page reports on different research groups.

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- The three documents should be emailed to pon@rice.edu, jdh@rice.edu, pasquali@rice.edu, and the professor whose lab was reviewed by 5 p.m. on their respective due dates of September 5, September 19, and October 3.
- A hard-copy ordered list of three prospective advisors should be submitted to Ms. On, 203 Space Science, by 5 p.m. Friday October 10.

Students who applied to the Rice Chemistry PhD program to continue a formal advising relationship may bypass this process and join a lab directly. Examples are:

- 1) A new graduate student who was previously a Rice undergraduate and who has performed undergraduate research can ask to be immediately affiliated with his/her undergraduate research advisor.
- 2) A new graduate student who worked as a visiting researcher *before applying* to the Rice PhD program can also ask to be immediately affiliated with that lab. After this request has been made, the above-described departmental verifications still apply but the student need not complete the three lab investigations. This early request to bypass the normal system must be completed on or before the first lab report is due (September 6).

Students cannot bypass the lab reviews if their sole previous affiliation with a potential advisor is research the summer before matriculation.

VI. Your Second Year

Advancement to Candidacy

Your second year in the Rice Ph.D. program has one major goal: advancement to candidacy. A student who has advanced to candidacy has completed all the requirements for a Ph.D. with the exception of their Ph.D. thesis. As discussed below, a student who has advanced to candidacy must still stay in good standing (including participation in CHEM 600 and adequate performance in CHEM 800). In order to advance to candidacy, a student must:

- Successfully complete 6 lecture courses (or their equivalent) as described above.
- Successfully complete three teaching units.
- Successfully complete (pass) their qualifying exam.
- Approval of the Ph.D. advisor who confirms that the student is making adequate progress toward a Ph.D.
- Departmental approval to continue in the Ph.D. program as confirmed by the signature of the Department Chair.

If you did not complete your coursework requirements in your first year at Rice, you must now complete them. Most students will still have one or two semesters of teaching.

Qualifying Exam

In addition, the major challenge for a student's second year is the successful completion of their qualifying exam. Complete details are available in the *Qualifying Exam Guidelines*, which is revised annually and included as an appendix to this student handbook. In all cases, the student is required to write a proposal which describes:

- The research that they have completed up until this point in their degree
- The conclusions they can draw from this work
- Their proposed work for the remaining Ph.D. (which, on average, is an additional three years of study).

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In addition to this written document, the student presents their work in a public seminar where anyone may ask questions. After the question and answer session, your committee will excuse the public and your exam will continue in private until your committee is satisfied that they can fully evaluate your work. Based on your written work, your public presentation and your ability to answer questions both in public and private, your committee will give you a numeric score in several categories, and detailed written feedback.

Each student either:

- 1) **Passes** with no further work required
- 2) Given an **incomplete** meaning that some portion of the exam requires revision which will be detailed by the committee
- 3) **Fails** the exam. If a student fails the exam they are required to leave the program unless their Ph.D. advisor successfully petitions the full department for an alternative outcome.

☆ The full and official details of the qualifying exam process are detailed in the *Qualifying Exam Guidelines* document found in Appendix A.

VII. Advancement to Candidacy to Graduation

A. Ongoing Requirements

After advancement to candidacy, a student's last major goal is to complete their Ph.D. thesis. While this is the focus, the student still has other obligations. In particular, all students are required to enroll and participate in CHEM 600 every semester they are a student. Failure to successfully complete the requirements of CHEM 600 (a grade of B- or worse) can lead to probation and / or expulsion from the program. Additionally, the student must make adequate research progress every semester as defined by their grade in CHEM 800. Any grade of B- or below in CHEM 800 results in a student being put on probation. Two semesters of bad performance in CHEM 600 or CHEM 800 typically result in a student being removed from the Ph.D. program.

The amount of time necessary for this and the actual composition of the thesis vary greatly with four to six years being typical. During this time a student typically publishes multiple peer-reviewed papers, which are critical milestones used to judge progress toward a Ph.D. Although your Ph.D. advisor usually has the best view of what qualifies as a sufficient body of work in your field when you are ready to defend your Ph.D., the Ph.D. degree is conferred by the department and university. Therefore the quality of your work must be of sufficient quality to pass the scrutiny of a committee that (minimally) includes: 1) your Ph.D. advisor, 2) another member of the chemistry faculty (including faculty fellows), 3) a faculty member whose primary appointment is in a department outside of chemistry. The student and Ph.D. advisor may also include additional faculty as they wish to more thoroughly evaluate the work.

B. Annual Evaluations

Students will receive annual evaluation after being advanced to candidacy. These evaluations are carried out through CHEM 600 as described previously and are based on the student's presented research progress and an evaluation by their research advisor.

C. Thesis Defense

When the student and advisor come to the conclusion that the required work for a Ph.D. is complete or nearly complete, the time comes to write the definitive work. The student should check <http://graduate.rice.edu/thesis/> for up-to-date deadlines, checklists and formatting requirements. In particular, examine the "Doctoral Thesis Submission" document and the "Thesis Format" and "Thesis Template Library" documents.

Please update the Graduate Program Coordinator, Pam On, during this process as she can help make sure that you are aware of all deadlines and administrative issues associated with defending your thesis.

When scheduling your thesis defense, please keep in mind that arranging a time that is suitable for you and the three or more faculty members on your committee is often difficult. Do not try to schedule this at the last minute! You will likely not get the date you want and may also unfavorably predispose your committee towards you. In particular, defense dates in February, March and April are very popular as they are the last times you can defend and still march in that year's graduation. Consequently, these dates are more difficult to reserve than others.

In addition to all the information provided on the above web page, please remember that your thesis committee must have adequate time to review your work. You must submit to your committee a copy of your thesis **a minimum of two weeks** before your thesis defense. This should usually be a hard copy. However, it may be in the form of an electronic document if there is an unavoidable reason why providing a hard copy is impossible (for example, due to travel), but this should be arranged and agreed upon by all members of the committee ahead of time. If the thesis is not turned in to the committee two weeks before the oral presentation, your exam will be cancelled and rescheduled for a later date.

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In addition, a hard copy (or electronic copy) of your thesis must be publicly available in the Chemistry Department office with the same two week lead time.

Finally, your thesis defense must be advertised on the Chemistry Department web page.

☆ *The above is not meant to be an official or comprehensive list of all requirements and time lines for the thesis submission and defense. The official and comprehensive documentation of requirements can be found at <http://graduate.rice.edu/thesis/>.*

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Appendix 1

Qualifying Examination Guidelines

2014-15

The purpose of the qualifying examination is to establish the extent to which the student has achieved intellectual independence and has demonstrated the research accomplishments appropriate to become a Ph.D. candidate. The examination consists of (1) a written proposal which summarizes research achievements and describes future goals and (2) a public research seminar immediately followed by a closed oral defense in front of a faculty committee.

The written document must be submitted and defended before the end of the fourth semester of residence. In addition to the written and oral exam, the student must also request a letter of evaluation from his / her advisor and ensure that it is sent to all the members of the exam committee. This letter is due at the same time as the written document.

Criteria: The student is evaluated on his / her ability to demonstrate:

1. A mastery of relevant background material, recent literature, and chemical concepts relevant to the described work
2. A clear research plan and understanding of the reasons why the research is being pursued at both a strategic level and day-to-day practical level that is sufficient and realistic for a 5-year Ph.D. (i.e., within the next 3 years)
3. A track record of concrete, scientifically rigorous research achievement
4. The ability to make a clear, concise presentation of scientific information and to verbally answer questions from the committee related to the presented research and to general, fundamental chemical concepts.

Written Document:

The written document is a combination of a research summary and research proposal. The ideal examination document should convey to the reader (1) that the student has identified a scientific problem or subdiscipline for study and has become an expert in this field, (2) that a careful research plan, appropriate for a single graduate career, has been developed that will create significant new scientific knowledge, and (3) that significant progress has already been made such that it appears likely that the student will complete the work necessary for the Ph.D. degree in an appropriate time frame.

Deadlines: Regardless of the student's oral presentation date, all students defending in the Spring semester are required to submit their written proposal by **4 PM on Monday March 9th** (the first day after spring break). Students defending outside of the Spring semester must turn in their proposal at least one week before the scheduled exam date. The text should be received both in electronic and hardcopy by all members of the exam committee. It is the responsibility of the student to make sure the committee has received the document on time. Failure to turn in the written document on time will result in failure of the exam (see below).

Length: The entire document, excluding Supporting Information and References, shall be 3500–

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7000 words. Supporting information and references may be of any appropriate length and do not count against the above word total. Documents that violate length restrictions will not be accepted.

Format: The document should be prepared in the *J. Am. Chem. Soc.* Template for Articles, which is accessible at http://pubs.acs.org/page/jacsat/submission/jacsat_templates.html. Note that there is a word limit rather than a page limit. It's important to develop expertise with templates, but the close spacing and small font makes it difficult to write comments. Please be willing to generate a version double-spaced in 12-point font on request.

Figures: Figures should be incorporated into the text as near as reasonable to the place where they are first mentioned. IMPORTANT: Figures must be properly referenced ("taken from ...", "adapted from ...", etc.). Figures not referenced will be assumed to be the sole creative work of the student.

Organization:

Abstract: Concise (250 word maximum) summary of proposal goals and justifications.

Introduction and Background Literature: Broadly, what are you trying to do and why is it important? What is already known about this topic? What researchers are currently leading the field? What are the major problems or gaps in knowledge in this field? What has your chosen lab already done in this area?

Specific Aims: Exactly what are you trying to do? Each of the 2-5 aims should be described concisely in 1-3 sentences.

Timeline: Describe the timeline in which the above Aims are expected to be accomplished (can be a graph).

Experimental Strategy: Specifically, what experiments will be performed to address the *Specific Aims*? If synthesis is required, are the steps reasonable? What is the mechanism? If an analytical technique is used, how does it work? Can it accomplish what is proposed? Is the instrument available at Rice? Does the order of the experiments make sense? Are there alternative routes to accomplishing your goals if your primary approach fails?

Research Accomplishments: Since coming to Rice, what have *you* (not other people in your lab) accomplished related to this goal? If you have already published or have a manuscript in review, you should indicate that here and what your specific contribution to that work has been. This section should be written as a logical summary of experiments and their ramifications. Key figures, graphs or images which help summarize this work are useful. However, detailed experimental procedures and data should be included in the *Supporting Information* section sufficient to prove any claims described here. In some circumstances you may have done a significant amount of work on a different project that has not worked out or is not related to the current proposal. Because one goal of the qualifying exam is to assess research achievement, it may be appropriate to discuss work on such projects here, describing the concrete results that led to significantly altering research goals.

Expected Outcomes: Assuming success in the experiments outlined in *Experimental Strategy*, what will the consequences of your work be? What will you have accomplished?

References (no word limit): These should be in a modified *J. Am. Chem. Soc.* format which includes the title of the article for example (please note that journal names should be properly abbreviated, e.g.: *J. Am. Chem. Soc.*, not *Journal of the American Chemical Society*):

Bachilo, S. M.; Strano, M. S.; Kittrell, C.; Hauge, R. H.; Smalley, R. E.; Weisman, R. B. "Structure-Assigned Optical Spectra of Single-Walled Carbon Nanotubes" *Science* **2002**, *298*, 2361-2366.

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Your references should be almost entirely from the primary literature. References to outstanding reviews or textbooks may be appropriate for broad, well known or old concepts. The internet is not typically acceptable. Avoid Wikipedia. **Improper referencing may be construed as plagiarism and result in failure of the qualifying examination and/or expulsion.** The Rice Honor Code, as always, is in effect for this examination.

Supporting Information (no word limit): This should include detailed JACS-style experimental procedures for all experiments described both in your Experimental Strategy and in your Research Accomplishments. Any data necessary to prove the results mentioned in Research Accomplishments should be included here. Portions of this section can be taken directly from any manuscripts already written by the student (but still must be properly referenced).

Written documents which do not follow the guidelines described above may be returned for revision before the oral examination takes place or result in failure of the examination (see below).

Oral Defense:

The student will present his or her work as a public seminar using a professional-quality presentation. These will be scheduled as part of CHEM 600. The student is responsible for the technical aspects of the presentation (for example the working of the projector and interface with the computer). The presentation should last 25-30 minutes and will be followed by questions from the general audience. Following the public presentation and questioning, the closed portion of the defense will commence with only the members of the student's committee. The examination may include (but is not limited to): clarification of a point or a request to discuss a point in more detail to ascertain whether the student understands in detail the concepts being presented; speculative questions to force the student to consider new ideas or alternative approaches and to think on his/her feet; and questions addressing fundamental chemical concepts relevant to the described work. The student will be scored independently by each committee member on four questions (see below) from 1–5 with a 5 being the best possible score.

Possible Outcomes:

The exam committee has the following options after having reviewed the student's written and oral proposal and advisor's letter of recommendation. The decision will typically be made by the committee immediately following the examination, but always within 72 hours.

- 1) **Pass.** If the average score on each of the four questions is 3 or above, and the committee feels that no revisions, corrections or addendums are needed, the student passes. Nothing further is needed from the student.
- 2) **Incomplete.** The student neither passes nor fails the qualifying exam. An incomplete denotes a strong performance exhibiting solid achievement, but with one or more areas in which the student's progress towards the thesis could be facilitated by doing something more. A written revision / addition is probably expected. Additional experimental work may also be requested. *The committee chair will describe in writing exactly what is required of the student and the timeline for its completion.* Please see "Exam Revisions" below.

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- 3) **Fail.** The student fails the qualifying exam. This is typically the result of multiple major flaws in scientific reasoning and / or a significant deficiency in research progress. The committee believes that advancement to candidacy is not appropriate in this case, and the student is generally not permitted to retake the exam. The student's research advisor may petition the full department to allow the student to defend a Master's thesis if s/he believes this is warranted. If the Master's thesis is successfully defended the student may be promoted to Ph.D. candidacy. In any case, the student is placed on probation.

Exam Revisions:

Within one week of the oral examination, the committee chair will prepare a written analysis of the student's exam performance, and will provide a copy of this analysis to the student, his/her advisor, and the chair of chemistry graduate studies. If the student scores an incomplete on the examination, this document will clearly indicate what is being asked of the student and provide concrete deadlines for the tasks requested. When corrections or additions to the written document are requested, the student should provide an itemized commentary describing the changes made in response to each point raised by the committee. If the committee has asked for an in person defense of the revision, public or private, any written documents must be turned in one week before the established meeting date. The committee will inform the student if revisions are sufficient within two weeks of receipt of that document. The committee may score the revision as a Pass, Incomplete or Fail. If the student passes, nothing further is needed. If the student earns an incomplete or fail, the student is placed on probation. Further, if the student is given an incomplete the student's research advisor may choose to allow the student to defend a Master's thesis if s/he believes this is warranted. If not, the student must leave the chemistry program. If the committee scores the revision as a fail the student's research advisor may petition the full department to allow the student to defend a Master's thesis. If not, the student must leave the chemistry program. In the case that a student is placed on the Master's track, a successfully defended Master's thesis may allow the student to be promoted to Ph.D. candidacy.

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Questions and Scoring:

The committee member will evaluate the student's performance in each category on a 1-5 scale as below.

- 5 - Performance quality (not necessarily quantity) consistent with that of a very good PhD defense.
- 4 - Performance quality (not necessarily quantity) would be adequate, but not exceptional, at a PhD defense.
- 3 - Performance that is expected for a Ph.D. candidate. Achievement/knowledge is beyond that expected of a first-year graduate student or undergrad (i.e., in terms of accomplishments, significantly more work is presented than that expected of an undergrad during a school year or REU session).
- 2 - First-year graduate student level knowledge/achievement
- 1 - Clear deficiencies

To pass each category, students must average a 3 from their committee members. A mean below 3 in any category equates to not passing the qualifying exam. Only that deficient category need be readdressed to pass a second effort. A low score in the research progress section may indicate the presenter should go back to the lab for several months before a re-examination.

1. Mastery of Scientific Concepts:

- () *Did the student demonstrate a mastery of relevant background material, recent literature, and chemical concepts relevant to the described work?*

2. Research Progress:

- () *Has the student demonstrated a track record of concrete, scientifically rigorous research achievement? **To pass this category, a student must present results that are well supported by rigorous data appropriate for someone who has completed a quarter or more of the expected time to the Ph.D. degree.** In most chemical disciplines, this would require a substantial progress towards a publishable manuscript, such as proving or disproving a hypothesis, establishing an appropriate mass of sufficiently interesting facts, or developing an instrument, method, or approach with unambiguous value.*

3. Proposed Work:

- () *Did the student present—through both written and oral communication—a well thought out and scientifically significant proposal for future work, and did the student present a sensible research plan to carry out this plan?*

4. Presentation/Communication:

- () *Did the student able make a clear, concise presentation of scientific information (written and oral) and to answer questions from the committee? **The written document should be to the standards of a submission to a peer reviewed journal such as *J. Am. Chem. Soc.* The oral presentation should be of the quality necessary for a national meeting such as the ACS.***