

**THE SCHOOL OF CHEMISTRY AND BIOCHEMISTRY
GEORGIA INSTITUTE OF TECHNOLOGY**

**GRADUATE
STUDENT
HANDBOOK**

AUGUST 2013

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PREFACE

An Overview of the Graduate Curriculum in Chemistry and Biochemistry at Georgia Tech

The graduate curriculum in the School of Chemistry and Biochemistry builds on a student's undergraduate experience to provide an exceptional degree of professional development required to embark on a fruitful and challenging career. Two graduate programs are offered in the School of Chemistry and Biochemistry. Students in the MS program complete coursework and have the option of conducting research. The Ph.D. curriculum provides further development of key skills required to complete high quality, world recognized research.

In the first two years of the program, you will complete courses that provide a bridge between introductory (undergraduate) material and contemporary research. Some flexibility in the choice of classes will allow you to direct the curriculum towards your developing research interests.

In the fall semester of the first year, you will participate in the *Faculty Seminar*. Members of the faculty discuss their research interests. This is a time to learn more about the expertise in the department, and the first step in the process of selecting a research advisor. The seminar also includes presentations on teaching enhancement, scientific databases, and chemical safety. In the spring semester of the first year, you will participate in Information Resources for Chemists and Biochemists (which includes seminars on Responsible Conduct of Research/Ethics, chemical safety training, careers, and professional development).

Students pursuing their Ph.D. take a series of *literature examinations* administered in Jan-Aug of the first year. These exams aid in the transition from the lecture-based delivery of material to the self-guided critical evaluation of the recent research literature. The examinations require that you apply knowledge from courses and self-study to understand important research topics. As in many other aspects of graduate study, collaboration among students in preparing for these exams is strongly encouraged (Please refer to Georgia Tech's Academic Honesty policy regarding collaborative work). In the second year, you will present your own seminar in the *Student Seminar* series.

Upon successful completion of the literature examinations, students should complete a *Ph.D. Candidacy Examination*, composed of: (i) a review of initial progress in research and (ii) an original research proposal. The original proposal requires that you propose an innovative solution to a current problem of your own choosing in your major area of study through application of sound reasoning based on good precedence from the literature. This is also a time for you to meet with your thesis committee to further define the scope of your research plans.

Students should begin research as soon as possible, but no later than sometime during the second semester in residence. Although each Ph.D. student has a set of individual goals,

progress in research often relies on teamwork. While the traditional areas of analytical, biochemistry, inorganic, physical and organic chemistry serve as the foundation for the research programs, many of the research projects are highly interdisciplinary and involve collaborations with other scientists and engineers in the department, across campus, at other universities or in industry. This partnership may include research off-campus or industrial co-op experience. In addition to publishing their research in world-renowned journals, students are encouraged to present their work at regional, national and international conferences. Funds are available for this purpose.

Students are eligible for Ph.D. candidacy by the end of the second year upon successful completion of the Ph.D. Candidacy Examination. The only remaining formal requirement is completion and presentation of the Ph.D. thesis under the guidance of a research advisor and thesis committee. The final Ph.D. thesis defense should be a presentation of how your goals, methods and results allow you to draw definitive conclusions of value to the scientific community and society. While serving as a final examination, the thesis defense should also represent the pinnacle of academic achievement.

The Ph.D. curriculum in the School of Chemistry and Biochemistry at Georgia Tech is both nurturing and challenging. It fosters teamwork, problem solving, innovation, and critical evaluation and presentation of data. Through this curriculum, students are prepared for a diverse array of careers in industrial, academic and government positions and the challenges that wait.

1. INTRODUCTION

This handbook has been prepared for graduate students in the School of Chemistry and Biochemistry at the Georgia Institute of Technology (Georgia Tech). It will acquaint students with some of the regulations and procedures of the School which relate to graduate study. It is intended to be a supplement, not a substitute, for other published material, such as the *Georgia Tech General Catalog*.

Each graduate student should have copies of these publications and consult them for information. Questions about academic issues should be addressed with Dr. Cameron Tyson in the Academic Programs Office, in Molecular Science and Engineering 2222L, telephone 894-8227, or Dr. Angus Wilkinson in Molecular Science and Engineering 1100J, telephone 404-894-4036.

1.1. GRADUATE STANDING

Students who satisfy the entrance requirements (see *General Catalog*) as judged by the Graduate Committee, the School Chair, the Registrar, and the Vice Provost of Graduate Education and Faculty Affairs are admitted to full graduate standing.

A student whose academic background does not meet the requirements for the B.S. in Chemistry and Biochemistry at Georgia Tech may be admitted as non-degree seeking special student. These students will take courses to make up for the background deficiency and to demonstrate the ability to do effective work (GPA of at least 3.0 in approved lecture courses) before they may reapply for admission with full graduate standing. Graduate courses passed as a non-degree seeking student may be counted toward a degree requirements upon acceptance into a degree program. Students who wish to enroll for course work but not to pursue a program of study toward a graduate degree may be admitted as special graduate students upon approval of the Graduate Committee, the School Chair, the Registrar, and the Vice Provost of Graduate Education and Faculty Affairs. If accepted into a degree program at a later date, students may petition for courses taken on special standing to be counted toward a graduate degree.

1.2. THE GRADUATE COMMITTEE, GRADUATE COORDINATOR AND ACADEMIC PROGRAMS OFFICE

Academic issues related to graduate studies in the School of Chemistry and Biochemistry are handled by the Graduate Committee. The 2013-2014 Graduate Committee consists of Cameron Tyson (Co-Chair), Joseph Sadighi (Co-Chair), Ken Brown, M.G. Finn, Rigoberto Hernandez, Yomi Oyelere, Pamela, Peralta-Yahya, Amit Reddi, Inga Schmidt-Krey, Carrie Shepler, Ronghu Wu, John Zhang, Keith Oden (ex officio), Adam McCallum (student representative).

Proposed minor programs, programs of study for the M.S. degrees, petitions, and other requests for Graduate Committee action and recommendation should be submitted to Dr. Cameron Tyson in the Academic Programs Office. (Please note the Institute deadlines for submission of degree petitions which are posted on the Institute Graduate website: www.grad.gatech.edu).

Procedural issues related to graduate studies are handled by the Academic Programs Office located in Molecular Science and Engineering Office 2222L of the School of Chemistry and Biochemistry. Questions may be addressed to Dr. Cameron Tyson (Director of Graduate Studies).

2. ACADEMIC PROGRAM REQUIREMENTS

2.1. REGISTRATION

All full-time students are required to register for at least two approved lecture courses which count towards the program of study for the Master's program or PhD program in the first semester and two in the second semester. Students are required to maintain a minimum grade point average of 2.70 for the M.S. and 3.00 for the Ph.D program. Any student with a lower average will be advised that he or she must improve the GPA to the minimum required for their program in order to continue to receive financial aid. Students with an overall GPA below 2.70 in graduate chemistry lecture courses will not be allowed to continue graduate study beyond the first two academic semesters. Descriptions of requirements for MS and PhD degrees are shown Section 4 and 5, respectively. Financial assistance in the form of a teaching or research assistantship requires maintenance of good standing (Section 6).

All full time graduate teaching and research assistants are required to register during Phase I for 21 credits (of which 12 must be letter grade or pass/fail basis) in the fall and spring semesters and 16 credits (of which 12 must be letter grade or pass/fail basis) during the summer semester. Schedules will consist of lecture, seminar, assistantship, and thesis hours.

- The number of lecture course hours will vary each semester.
- Students are required to register for Chem 8000-Departmental Seminar (1 credit, Thursdays from 4-5 pm unless otherwise noted) during Fall and Spring Semesters until admitted to Ph.D. Candidacy
- Teaching Assistants will register for 3 credits of Chem 8997-Teaching Assistantship (if applicable).
- The remaining hours will be thesis hours (Chem 7000-Masters Thesis or Chem 9000-Doctoral Thesis).

2.2. TRANSFER AND ADVANCED STANDING CREDIT

Students requesting the use of credit for graduate courses taken at other institutions must petition the graduate committee within the first month of residence at Georgia Tech. The amount of credit which can be transferred, and the way in which it is transferred depends on the program of study (MS see Section 4.5; PhD, see Section 5.4) and performance on courses at Georgia Tech in the first semester or residence.

Students who have taken an advanced undergraduate class which covers the same material at the same level as a regularly offered graduate class in the School of Chemistry and Biochemistry may apply to take an examination for advanced standing.

2.3 CHOOSING A RESEARCH ADVISOR (to be completed by Feb 1 of first year)

Students entering in summer and fall semesters must enroll in Chem 8901 (fall semester) and attend lectures given by the faculty. This course is graded based on attendance. Students should arrange meetings with a number of individual faculty members to discuss specific research projects. The student must select a research advisor by February 1st. A student should submit an *application* to join a research group between November 15-February 1. *Final decisions for joining a research group are made by the departmental chair. Acceptance into a research group is contingent on space and resources available.*

See the brochure, *Graduate Studies in Chemistry and Biochemistry* and departmental webpages for detailed descriptions of faculty research interests.

2.4 HONOR CODE AND PROPER ETHICAL CONDUCT

Students are expected to comply with the Georgia Tech Honor Code and maintain proper ethical conduct in research and publication. A copy of the Honor code is available in the *Georgia Tech General Catalog* or <http://www.honor.gatech.edu/>. In addition, guidelines for ethical conduct in research and publication for chemists and biochemists can be found at <http://pubs.acs.org/instruct/ethic2000.pdf>.

Plagiarism is the act of stealing others' ideas and work and misrepresenting this information as your own work. It is a **serious** offense of academic misconduct and a violation of the student honor code at Georgia Tech. In order to familiarize yourself with plagiarism, please visit the below site for examples and information on plagiarism:

<http://www.indiana.edu/~wts/wts/plagiarism.html#original>

3. GRADUATE COURSES

All courses are 3 credits L/G, P/F or audit unless noted otherwise.

CHEM 6170	Inorganic Chemistry I
CHEM 6171	Inorganic Chemistry II
CHEM 6172	Physical Methods in Inorganic Chemistry
CHEM 6181	Chemical Crystallography
CHEM 6182	Chemistry of the Solid State
CHEM 6183	Organometallic Chemistry
CHEM 6271	Analytical Chemistry I
CHEM 6272	Analytical Chemistry II
CHEM 6281	Mass Spectrometry
CHEM 6282	Chemical Sensors
CHEM 6283	Electroanalytical Chemistry
CHEM 6284	Environmental Analytical Chemistry
CHEM 6285	Analytical Spectroscopy
CHEM 6371	Identification of Organic Compounds
CHEM 6372	Physical Organic Chemistry
CHEM 6373	Organic Synthesis
CHEM 6381	Advanced Organic Synthesis
CHEM 6382	Computational Methods in Organic Chemistry
CHEM 6471	Chemical Thermodynamics and Kinetics
CHEM 6472	Quantum Chemistry and Molecular Spectroscopy
CHEM 6481	Statistical Mechanics
CHEM 6482	Chemical Kinetics and Reaction Dynamics
CHEM 6483	Chemistry of Electronic Materials
CHEM 6484	Optical Organic Materials
CHEM 6485	Computational Chemistry
CHEM 6491	Quantum Mechanics
CHEM 6492	Molecular Spectroscopy
CHEM 6501	Biochemistry I
CHEM 6502	Biochemistry II
CHEM 6571	Enzymology and Metabolism
CHEM 6572	Macromolecular Structure
CHEM 6573	Molecular Biochemistry
CHEM 6581	Protein Crystallography
CHEM 6582	Biophysical Chemistry
CHEM 6583	Drug Design and Discovery
CHEM 6584	Contemporary Biochemistry
CHEM 6750	Polymer Synthesis (cross-listed with Materials Science and Engineering)
CHEM 6751	Physical Chemistry of Polymer Solutions (cross-listed with Materials Science and Engineering)
CHEM 6752	Polymer Characterization (cross-listed with Materials Science and Engineering, 4 credits)
CHEM 6755	Theoretical Chemistry of Polymers (cross-listed with Materials Science and Engineering)

CHEM 6756	Signaling Molecules
CHEM 6760	Biocatalysis
CHEM 6765	Drug Development
CHEM 7000	Masters Thesis (1-21 credits, P/F)
CHEM 7001	Introduction to Research (3 credits, L/G)
CHEM 8000	Seminar (1 credit, P/F)
CHEM 8813	Special Topics in Inorganic Chemistry (1-3 credits)
CHEM 8823	Special Topics in Analytical Chemistry (1-3 credits)
CHEM 8833	Special Topics in Organic Chemistry (1-3 credits)
CHEM 8843	Special Topics in Physical Chemistry (1-3 credits)
CHEM 8853	Special Topics in Biochemistry (1-3 credits)
CHEM 8873	Special Topics in Polymer Chemistry (1-3 credits)
CHEM 8901	Special Problems-Faculty Seminar (2 credits, P/F)
CHEM 8902	Special Problems-Student Seminar (2 credits, P/F)
CHEM 8903	Special Problems-Student Seminar (2 credits, L/G)
CHEM 8997	Teaching Assistantship (1-9 credits, P/F)
CHEM 8998	Research Assistantship (1-9 credits, Audit)
CHEM 9000	Doctoral Thesis (1-21 credits, P/F)

4. REQUIREMENTS FOR THE MS DEGREE

4.1. INTRODUCTION

This section is a summary of the requirements for the MS. More details are given in later sections of the *Graduate Handbook*.

There are two options for completing the MS degree: Thesis Option and Non-Thesis Option.

4.2. REQUIREMENTS FOR THE MS (THESIS OPTION)

- 12 credits (four 3-credit courses, L/G) in an area of specialization (see Major areas for PhD program, Section 5.1).
- 6 credits (two 3-credit courses, L/G) in a second area of specialization (see Major areas for PhD program, Section 5.1).
- 6 credits approved free elective, including any course from the listed areas of specialization (see Major areas for PhD program, Section 5.1) and seminar courses. A maximum of 3 credits can be on pass-fail basis.
- 6 credits of Masters Thesis (CHEM 7000)
- Completion of a thesis describing original research

Note: All coursework and seminars required for the program of study must be completed within the first two years of study. Also, see Section 2 for Information about minimum academic requirements for graduate standing.

For the M.S. degree (thesis option), the student must demonstrate the ability to conduct independent research as shown by the accomplishment of high-caliber work that should result in publication. This research will form the basis for the M.S. thesis.

Upon selection of a research topic, the student must file a “Request for Approval of Master’s Thesis Topic” (see www.grad.gatech.edu). The form consists of a dissertation title and brief formal statement describing their thesis research.

The research thesis must be written while enrolled at Georgia Tech. The candidate must present a treatise in which is set forth, in good literary English, the results of an investigation directed by a member of the faculty of the School of Chemistry and Biochemistry. The form of the thesis is described in the Manual for Graduate Theses, available from the Division of Graduate Studies and Research (see www.grad.gatech.edu). The rough draft of the thesis should be submitted to the Thesis Reading Committee **at least 14 days** before graduation. The thesis reading committee consists of at least three members, the majority of whom must be members of the School of Chemistry and Biochemistry.

4.3. REQUIREMENTS FOR THE MS (NON-THESIS OPTION)

- 12 credits (four 3-credit courses, L/G) in an area of specialization (see Major areas for PhD program, Section 6.1).
- 6 credits (two 3-credit courses, L/G) in a second area of specialization (see Major areas for PhD program, Section 6.1).
- 3 credits (one 3-credit courses, L/G) in any area of specialization (see Major areas for PhD program, Section 6.1).
- 9 credits of approved free electives, which may include any course from the listed areas of specialization (see Major areas for PhD program, Section 6.1), CHEM 7001, 8000, 8901, 8902, or 8903. A maximum of 3 credits on pass-fail basis may be used.

Note: All coursework and seminars required for the program of study must be completed within the first two years of study. Also, see Section 2 for Information about minimum academic requirements for graduate standing.

4.4. TRANSFER OF CREDIT FOR THE MS PROGRAM

Students may request transfer of credit for graduate courses taken at other US or Canadian institutions that were not used to satisfy degree requirements at that institution. Requests must be made within the first month of residency at Georgia Tech. A maximum of 6 credits may be transferred. Students may petition the graduate committee to take other courses for which they are adequately prepared by “Advanced Standing”.

4.5. APPROVED PROGRAM OF STUDY, PETITION TO GRADUATE AND EXIT INTERVIEW/CLEARANCE FORM (see Institute deadlines)

Candidates for the M.S. degree must file a “Petition for Degree” (available from the Registrar’s Office) with the Registrar by the required Institute deadlines (see www.registrar.gatech.edu). Students who do not complete their requirements and graduate when anticipated must file an extension to postpone their graduation to the following semester.

Upon completion of the M.S. degree program or upon termination of the program for any reason, the student is expected to meet with the Director of Assessment of the School of Chemistry and Biochemistry for an exit interview. For more information, see: <http://www.chemistry.gatech.edu/academics/graduate-academic-forms>

All students are required to complete a clearance form prior to departure: <http://www.chemistry.gatech.edu/academics/graduate-academic-forms>

5. REQUIREMENTS FOR THE PhD

5.1 INTRODUCTION

This section is a summary of the requirements for the PhD. More details are given in later sections of the *Graduate Handbook*.

The PhD program in Chemistry requires successful completion of five classes with a grade of A or B, a series of seminar courses, a PhD candidacy examination and defense of a thesis describing original research.

- Coursework in the field of specialization consists of three or four 3-credit courses, CHEM 6XXX.
- Students must also take one or two 3-credit classes in another area of specialization.
- Completion of a series of seminars (CHEM 8901, 8902, 8903)
- In addition to courses and seminars, PhD candidates must complete:
 - a series of literature exams
 - a PhD candidacy exam within 3 months of completion of the lit exam requirement
 - a Data Review 6 months prior to thesis defense
 - a thesis defense describing original research

5.2 COURSEWORK

Doctoral students take a group of courses in their field of specialization. Specific major course requirements are discussed under each Major Program of Study (below). The major consists of three or four 3-credit courses at the A or B grade level. Courses graded below a B cannot be used to satisfy this requirement.

Areas of specialization are:

Inorganic Chemistry

Five classes required from the following:

- CHEM 6170, 6172
- one or two courses chosen from CHEM 6181, 6182, 6183, 8813
- one or two classes in another area

Analytical Chemistry

Five classes required from the following:

- CHEM 6271
- two or three courses chosen from CHEM 6281, 6282, 6283, 6284, 6285, 8823
- one or two classes in another area

Organic Chemistry

Five classes required from the following:

- CHEM 6371, 6372, 6373, 8833 (introduction to organic mechanisms)
- one course chosen from CHEM 6183, 6381, 6382, 6583, 6750, 8833 or a class in another area

Physical Chemistry

Five classes required from the following:

- CHEM 6481 or 6482 or 6755
- CHEM 6472 or 6491 or 6492
- one or two other courses chosen from: CHEM 6471, 6481, 6482, 6483, 6484, 6485, 6491, 6492, 6755, 8843
- one or two classes in another area

Biochemistry

Five classes required from the following:

- CHEM 6571, 6572, 6573
- one course chosen from CHEM 6581, 6582, 6583, 6584, 8853 or a class in another area
- one class in another area

Polymer Chemistry

Five classes required from the following:

- CHEM 6750 and 6752
- one of the following: CHEM 6751 or 6755
- one course chosen from: CHEM 6751, 6755, 8873, PTFE 6200, 6301, 6768, CHE 6609, 6778 or a class in another area
- one class in another area

Paper Science and Engineering (PSE)-Chemistry (an interdisciplinary degree option-this curriculum requires completion of requirements for an area of specialization (above) and four PSE classes).

All students funded on a PSE Fellowship must complete 12 credits of PSE coursework. These 12 credits constitute a PSE minor or, when combined with other courses determined by the home school, constitute the curriculum for a PSE degree. See appendix for PSE coursework approval form.

Required of students in all home schools

ChBE/ME 6741	Pulp and Paper Manufacture I
ChBE/ ME 6742	Pulp and Paper Manufacture II

Two courses from the following list

ChBE 6232: Chemical Engineering Processes in Pulp & Paper Manufacturing
ME 6281: Mechanics of paper forming and coating
ME 6140: Physical properties of paper
MSE 8803L: Environmental degradation of materials

CHEM 8803: Pulping and bleaching chemistry

Other courses may be added to this list after approval by the PSE Faculty Committee.

5.3 GPA REQUIREMENTS

- Students must have a GPA of > 2.50 in at least two or more classes in the first semester to be allowed to continue with literature exams. Students with a GPA < 2.50 in the first semester may not continue in the PhD program without approval of the graduate committee.
- Grades of “C” do not count toward the five course requirement for a PhD. Students earning a “C” will have to take approved additional coursework to remove this deficiency.
- Students must have a GPA of > 2.70 in at least four or more classes at the end of the second semester in order to continue in the PhD program. Students with a GPA < 2.70 may not continue in the PhD program without approval of the graduate committee.
- **Georgia Tech has a minimum cumulative GPA requirement is a 3.00.**

5.4 TRANSFER OF CREDIT FOR THE PhD PROGRAM

Students may request transfer of credit for graduate courses taken at other institutions within the first month of residency at Georgia Tech. Credit will only be transferred if a student completes three courses in the first semester of residence at the “A” or “B” level which can be used toward a major area of specialization or minor.

5.5 REQUIRED SEMINAR COURSES

Students in the PhD program must complete a series of seminar courses (CHEM 8901-2-3) and CHEM 7001 in their first three semesters in residence, and register for departmental seminar (CHEM 8000) *every* semester in residence except summer residence.

CHEM 7001 Introduction to Research (3 cr., first Summer, L/G)

CHEM 8000 Seminar (1 cr, each seminar, P/F)

This course is for 1 credit hour and is on a Pass/Fail basis. The grade for the Departmental Course will be based on attendance at departmental seminars. All graduate students in chemistry are required to attend these seminars on Thursday afternoons.

CHEM 8901 Faculty Seminar (2 cr, first Fall, P/F)

Students will enroll in Chem 8901 (Faculty seminar) during the fall semester of their first year. The purpose of this course is to aid students in advisor selection as well as familiarize them with the research being conducted in the department.

CHEM 8902 Information Resources Seminar (2 cr, first Spring, P/F)

Students will enroll in Chem 8902 (Information resources seminar) during the spring semester of their first year. The purpose of this course is to introduce students to topics such as scientific ethics, chemical safety, intellectual property, scientific career opportunities, diversity workforce issues, research proposal development, and responsible conduct of research.

CHEM 8903 Student Seminar (3 cr, second Fall, L/G)

All graduate students will enroll for Chem 8903 (Student seminar) in the fall semester of the second year. The course consists of a series of seminars by students on topics from the recent research literature. This seminar must be passed with an A or B. Students obtaining a lower grade will be required to retake the seminar in the following year.

5.6 PhD LITERATURE EXAMINATIONS (to be completed by end of second year)

Students begin literature exams in January of the first year only if they have successfully completed at least two graduate classes in the first semester with a GPA > 2.50.* Eight literature exams will be given in Jan.-Aug. in the first year. The literature exams will be based on reading assignments from the recent research literature. Reading assignments will be posted two weeks before the scheduled exam date. The exam will cover topics, concepts, models, data, etc. that are relevant to the literature assignment and may ask for a critical assessment of the data and information. All exams will be scheduled in the evening to avoid conflicts with classes and teaching assignments. The length of the exam will be 2 hours.

There will be separate examinations in each area of specialization. Each literature exam will be graded on a scale from 0 to 4. A student must accumulate 16 points from 8 consecutive exams to successfully complete the requirement. Students are allowed to take only one test at each exam period. To ensure fairness, the literature exams will be coded so that the identity of the person submitting the exam is unknown to the faculty member grading the exam. Unexcused absences from examinations will result in a grade of zero on that exam. If absent from an exam for a legitimate, excusable reason, a student may petition (in writing) the Graduate Committee for special considerations.

*Upon return of the exam, students have one week to file a formal petition with the Academic Programs Office for re-grade of their literature exam. This written petition should clearly and concisely address each question that is being considered for re-grade. **Immediately prior to or during this re-grade period, any communication directly with the professor of record for the exam will result in disqualification of any possible re-graded score.** All literature grades are final after the re-grade period.*

Only those students who successfully complete the literature examination requirement proceed to the Student Seminar and PhD candidacy examination requirements.

Students who are mathematically eliminated from successfully completing the literature examination requirement will be notified that they must not take the remaining examinations. These students will be strongly advised to take additional courses and must successfully

complete the literature exam in the following academic year before proceeding to the student seminar (CHEM 8903) or PhD candidacy exam requirements.

* Unless approved otherwise by the Chemistry and Biochemistry Academic Programs Office

5.7 APPOINTMENT AND COMPOSITION OF THE PhD COMMITTEE

The PhD committee must be appointed by July 15th of the first year of graduate study. The committee, including the research advisor, will consist of:

- (i) Three members of the academic faculty of the School of Chemistry and Biochemistry (i.e., tenured or tenure-track; NOT adjunct)
- (ii) One member of the academic faculty from a PhD or MD granting department with no type of appointment (other than adjunct) in the School of Chemistry and Biochemistry.
- (iii) A member of the academic faculty or Principal Research Scientist from the School of Chemistry & Biochemistry, another school at Georgia Institute of Technology, or a PhD-level member of staff from another research organization (GTRI, IPST, industry, national laboratory, or PhD or MD granting academic department, etc) who has been involved in collaborative research described in the student's thesis.

*Note: For Paper and Science Chemistry, (i) and (ii) and 3 Paper and Science faculty are required.

Other, non-voting, members of the committee may be appointed IN ADDITION to the five members identified above, not to substitute for them. Per Institute requirements, the School's Graduate Committee will review and approve the composition of thesis committees.

Students should consult with their research advisors about appropriate members for their thesis committee. Students are required to submit the composition of the thesis committee names for approval by July 15th via email to the Academic Programs Office (email: cam.tyson@chemistry.gatech.edu)

5.8 TRANSFER TO THE MS PROGRAM

Students may be transferred to the MS program at the end of the first year if any of the following apply:

- (i) GPA < 3.00
- (ii) Complete fewer than 4 lecture courses towards the PhD (at the A or B level)

These conditions also affect eligibility for support as a graduate assistant (see Section 6.2)

Students will be transferred to the MS program upon failing the literature exam requirement a second time.

Upon successful completion of the literature examination requirement, a student should proceed to the Ph.D. Candidacy Examination (see Section 5.9).

5.9. Ph.D. CANDIDACY EXAMINATION

To be completed within 2 semesters of completing literature exams (i.e., normally by the end of the fifth semester). The examination should be scheduled with the committee at least three months in advance.

The Ph.D. Candidacy Examination consists of written and oral presentation of: (I) an Initial Research Review and Thesis Proposal (Sections A-E below), and (II) an Original Proposal (Sections F-H below). These proposals must provide for an investigation of phenomena and acquisition of new knowledge, and must be based on the scientific method - gathering observable, empirical, measurable evidence, subject to the principles of reasoning.

The Ph.D. candidacy exam will be outgrowth of the student's mastery of the current literature, strengthened by scientific judgment arising from practical laboratory and research experience. The committee's evaluation will be based on a rating of work completed to date, mastery of the background and design of the project, and demonstrated understanding and application of fundamental principles of chemistry.

A hard copy of the examination paper along with a copy of the student's GT transcript should be submitted to the examination committee one week before the oral presentation. The paper should use the following headings. The length of each section is *suggested*. The entire proposal should be approximately 10-15 pages, excluding references.

I. INITIAL RESEARCH REVIEW AND THESIS PROPOSAL

A. Background to the thesis project (2-3 pages)

What are the key questions arising from recent literature in the field of the thesis topic? What other approaches are currently being explored in the group and by other groups? This section may also serve as background to Hypothesis/Aim-II (the "original research proposal").

B. Hypothesis/Aim-I (thesis proposal) (0.25 page)

Given the background in section A, what is your hypothesis for the thesis project? What are you trying to do? Be careful to write this in the form of a hypothesis.

C. Significance of the thesis project (0.5 page)

If your thesis project works, why would it be significant?

D. Preliminary research results (2-3 pages)

What have you achieved so far?

E. Experimental Approach-I (2-4 pages)

Beyond your achievements up to the present time, what is your experimental approach to addressing Hypothesis/Aim-I? What results might you expect and in what way would they support the hypothesis? What other possible outcomes are there and how would these modify your hypothesis (i.e., what do we learn if this approach fails?)

II. ORIGINAL RESEARCH PROPOSAL

F. Hypothesis/Aim-II (an “original proposal”) (0.25 page)

Hypothesis/Aim-II may be in the same general field as the thesis topic, building on the same background as provided in Section A. If Hypothesis-II is in the same field as the thesis topic, the goals of the proposal should be significantly different from the aims of the thesis project (and other research being conducted at Georgia Tech). If it is in an entirely different field you should provide 2-3 pages of background material as an appendix.

G. Significance of Hypothesis/Aim-II (0.5 page)

If your approach to address Hypothesis-II is successful, why would it be significant?

H. Experimental Approach-II (2-4 pages)

What is your experimental approach to addressing Hypothesis/Aim-II? What techniques will you use? What results might you expect and in what way would they support the hypothesis? What other possible outcomes are there and how would these modify your hypothesis (i.e., what do we learn if this approach fails?)

III. APPENDICES

I. References Cited

J. Background for Hypothesis-II (if in different area from the thesis project)

Potential outcomes of this examination are:

(i) Pass

(ii) Provisional pass - with any *minor* clarifications to be submitted within two weeks.

(iii) Fail - The committee may request that the student make a new presentation, which must be completed by the end of the following semester.

(iv) Fail - Transfer to the M.S. program.

Any student not successfully completing this requirement within 3 semesters of completing literature exams will be required to take classes to complete the non-thesis M.S. degree in the following semester.

5.10 DATA REVIEW

To be completed or scheduled prior to completion of the Online Application to Graduate-OAG (approx 6 mo. before graduation, deadline set by the Registrar’s office. See www.registrar.gatech.edu). The review should be scheduled with the committee at least three months in advance.

The purpose of this review is for the committee and student to determine what further work should be performed to complete the thesis. Students should provide a brief written and oral review of their thesis work to their Thesis Committee prior to petitioning for the PhD degree. This review is generally performed 6 months prior the Thesis Defense. The Thesis Committee should be provided with the following one week ahead of the review: (i) an outline of the thesis (a proposed table of contents), (ii) a short written summary of results (often in the form of published, submitted or in-progress manuscripts, and/or a short summary of unpublished results), and (iii) an outline of experiments proposed to complete the thesis.

5.11 PETITION TO GRADUATE (see Institute deadlines)

Candidates for the Ph.D. degree must file an “Online Application for Graduation-OAG” available at www.registrar.gatech.edu by the Institute deadlines. Additional forms and deadlines can be found at the GT graduate office website: www.grad.gatech.edu

5.12 THESIS DEFENSE

For the Ph.D. degree, students must demonstrate the ability to conduct independent research, as shown by the accomplishment of a considerable amount of high-caliber work that results in publications in the reviewed scientific literature. The student is expected to contribute to the theoretical as well as the experimental aspects of the investigation. The research thesis or dissertation must be written while enrolled at Georgia Tech. The thesis defense takes the form of an open seminar followed by a closed session with the thesis committee. The student must be enrolled during the semester in which the final doctoral examination is performed.

Guidelines for the final doctoral examination are described in the Manual for Graduate Theses, available from the Division of Graduate Studies and Research (see www.grad.gatech.edu). A copy of the PhD thesis should be provided to the committee **two weeks prior** to the final doctoral examination date.

Students must notify via email the Academic Programs Office of their defense by submission of a “Thesis Defense Announcement” via email *two weeks prior to the defense*. The announcement will be release via the Academic Programs Office to the department and a copy will be sent to the Georgia Tech Graduate Office.

5.13 EXIT INTERVIEW/CLEARANCE FORM

Upon completion of the PhD degree program, the student is expected to meet with the Director of Assessment of the School of Chemistry and Biochemistry for an exit interview. For more information, see: <http://www.chemistry.gatech.edu/graduate/curriculum/forms.php>

All students are required to complete a clearance form prior to departure:
<http://www.chemistry.gatech.edu/graduate/curriculum/forms.php>

SUGGESTED SCHEDULE FOR ENTERING STUDENTS

Fall

Graduate lecture coursework (6-9 credits = two or three classes)
CHEM 8901 Faculty Seminar
Research rotations (optional)
Aug/Sept: Apply for transfer graduate credit from another institution
November 15: Earliest date to apply to join research group

Spring

Feb. 1 Deadline for Selection of Research Advisor
Graduate lecture coursework (6 credits = two classes)
CHEM 8902 Resources Seminar
Literature Examinations

Summer

CHEM 7001 Introduction to Research
July 15th: Deadline for appointment of PhD Committee (Email names to Academic Office)
Literature Examinations

Second Year

Graduate lecture coursework (0-3 credits = zero or one class)
CHEM 8903 Student Seminar (Fall)
PhD Candidacy Exam:

End of Spring Semester: Deadline for Submission of Application for PhD Candidacy Exam to Academic Programs Office:

- (i) The Admission to PhD Candidacy form (available from www.grad.gatech.edu) signed by the entire committee
- (ii) A copy of the original research proposal
- (iii) A copy of the initial research review, and (v) a copy of the abstract for the CHEM 8903 Student Seminar

Later Years

3-6 mo. Prior to Defense: Data Review (Submit form to Academic Programs Office)

Two Weeks Prior to Defense
Submit Final Defense Schedule to Academic Programs Office
Submit Thesis to Committee

Defense
Seminar Presentation
Submit Thesis to Graduate School

5.14. INORGANIC CHEMISTRY PROGRAM OF STUDY

Courses

CHEM 6170 _____

CHEM 6172 _____

CHEM 61XX _____

Two courses (see Section 5.2) _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

*Submission of
"Request for Admission to PhD Candidacy", and associated
documents* _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

5.15. ANALYTICAL CHEMISTRY PROGRAM OF STUDY

Major

CHEM 6271 _____

CHEM 62XX _____

CHEM 62XX _____

Two other courses (See Section 5.2) _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

*Submission of
"Request for Admission to PhD Candidacy", and associated
Documents* _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

5.16. ORGANIC CHEMISTRY PROGRAM OF STUDY

Major

CHEM 6371 _____

CHEM 6372 _____

CHEM 6373 _____

CHEM 8833 (Introduction to Organic Mechanisms) _____

One other course (See Section 5.2) _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

*Submission of
"Request for Admission to PhD Candidacy", and associated
documents* _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

5.17. PHYSICAL CHEMISTRY PROGRAM OF STUDY

Major

CHEM 6481 or 6482 or 6755 _____

CHEM 6472 or 6491 or 6492 _____

CHEM 64XX _____

Two other courses (See Section 5.2) _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

*Submission of
"Request for Admission to PhD Candidacy", and associated
documents* _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

5.18. BIOCHEMISTRY PROGRAM OF STUDY

Major

CHEM 6571 _____

CHEM 6572 _____

CHEM 6573 _____

Two other courses (See Section 5.2) _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

*Submission of
"Request for Admission to PhD Candidacy", and associated
documents* _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

5.19. POLYMER CHEMISTRY PROGRAM OF STUDY

Major

CHEM 6750 and 6752

One of the following: CHEM 6751 or 6755

Two other courses (See Section 5.2)

Seminar Courses

CHEM 7001 Introduction to Research

CHEM 8000 Seminar

CHEM 8901 Faculty Seminar

CHEM 8902 Resources Seminar

CHEM 8903 Student Seminar

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form

Submission of

"Request for Admission to PhD Candidacy", and associated documents

Submission of "Completion of Data Review"

Submission of an "Online Application to Graduate"

Submission of emailed "Thesis Defense Announcement"

Thesis Defense

Submission of Thesis to Graduate Office

Exit Interview/Clearance Form

5.20. PAPER SCIENCE AND CHEMISTRY PROGRAM OF STUDY

Major

CHE 6630-Pulp and Paper Manufacturing I _____

CHE 6631- Pulp and Paper Manufacturing II _____

Two PSE Electives (see program of study form in appendix) _____

Four courses in a major area of Chemistry and Biochemistry _____

Seminar Courses

CHEM 7001 Introduction to Research _____

CHEM 8000 Seminar _____

CHEM 8901 Faculty Seminar _____

CHEM 8902 Resources Seminar _____

CHEM 8903 Student Seminar _____

Literature Exams

Jan. _____ May _____

Feb. _____ Jun. _____

Mar. _____ Jul. _____

Apr. _____ Aug. _____

Submission of "Research Advisor Selection" form _____

Submission of "Request for Admission to PhD Candidacy", and associated documents _____

Submission of "Completion of Data Review" _____

Submission of an "Online Application to Graduate" _____

Submission of emailed "Thesis Defense Announcement" _____

Thesis Defense _____

Submission of Thesis to Graduate Office _____

Exit Interview/Clearance Form _____

6. FINANCIAL ASSISTANCE AND EMPLOYMENT OPPORTUNITIES

6.1 TEACHING AND RESEARCH ASSISTANTSHIPS

Graduate students in the School of Chemistry and Biochemistry are often financially supported as Graduate Teaching Assistants (GTAs) or Graduate Research Assistants (GRAs). The usual form of financial support for entering graduate students is the GTA. Duties consist of a combination of laboratory supervision and instruction, proctoring of exams, presentation of recitation sessions, grading, office hours, and laboratory preparation. Teaching assignments are made by the undergraduate laboratory coordinators. Please see Appendix B: Guidelines for Graduate Teaching Assistants.

Students may be appointed to research assistantships that permit them to conduct full-time research for their thesis while pursuing advanced studies. GRA stipends are the same as for the GTA. Please see Appendix B: Guidelines for Graduate Research Assistants.

Students supported as Graduate Assistants (GTA or GRA), who are properly registered and making satisfactory progress towards degree, automatically receive a tuition exemption. These students are required to pay Institute fees each semester. Teaching and Research assistants are expected to perform their duties in a responsible and professional manner. Graduate assistants are expected to review and comply with Georgia Tech's policy on sexual harassment (<http://www.catalog.gatech.edu/genregulations/sexharrass.php>).

6.2 ASSISTANTSHIP REQUIREMENTS

Graduate students receiving financial assistance from the School of Chemistry and Biochemistry are required to register as full-time students, maintain good standing according to the Institute's academic standards (see www.registrar.gatech.edu), and make satisfactory progress towards their degree as outlined below:

1. Students must maintain good standing with the Institute. A student must maintain a GPA of 3.00 or greater in order to guarantee continuation of financial support.
2. Student must complete a minimum of four approved graduate classes by the end of spring semester of their first year with a grade of B or higher, and complete any remaining classes required for the Ph.D. with a grade of B or higher by the end of their second year.
3. Students are required to attempt eight literature exams in January-August of their first year and successfully complete the literature examination requirement by the end of the second year.
4. Ph.D. students are required to take the Ph.D. candidacy examination by the end of spring semester of their second year. Failing to pass this examination will result in transfer to the Master's program and possible loss of departmental support.

5. Students must maintain satisfactory grades and performance evaluations in research and teaching (see “Guidelines for Graduate Teaching Assistants”). Any student who receives an unsatisfactory evaluation will receive a letter from the Chemistry and Biochemistry Academic Office placing them on review, outlining the deficiencies and indicating corrective actions that must be taken to remove the deficiencies. A second unsatisfactory evaluation will result in loss of departmental support and being dropped from the program.
6. By the end of the second semester, students must have a research advisor in the School of Chemistry and Biochemistry in order to register for classes each term and to receive financial support.
7. Students must complete safety and right-to-know requirements of the department.
8. Support as a GTA will be limited to the first five years for Ph.D. candidates. Students who are beyond their fifth year of graduate study will only be appointed as a GTA based on the availability of positions.
9. Support to students who elect to change from the Ph.D. program to the M.S. program, and remain in good standing, will be limited to the amount of time in which they can reasonably complete all of the requirements for the degree. M.S. students will only be offered support based on the School’s need for GTAs.
10. Exceptions to the above conditions may be requested based on demonstration of extraordinary circumstances by petition to the Chemistry and Biochemistry Graduate Committee. The petition must include a letter of support from the student's thesis advisor and a demonstration of satisfactory progress toward degree objectives.

6.3 FELLOWSHIPS

Students are strongly encouraged to apply for fellowships awarded in national competition by the National Science Foundation, the National Institutes of Health, the John and Fannie Hertz Foundation, and other agencies. A list of science and engineering fellowships at Georgia Tech and elsewhere, can be obtained at <http://fundingopps.cos.com/>

6.4 LOANS

The Financial Aid Office, located in the Administration Building, can assist students in securing both short-term (emergency) and long-term loans.

6.5 EXTERNAL EMPLOYMENT

Teaching and Research Assistantships are awarded specifically to allow students to pursue full-time study towards the MS or PhD. Thus, students receiving financial assistance from the School of Chemistry and Biochemistry may not be employed elsewhere. In hardship cases, a petition may be submitted to the Graduate Committee for waiver of this

requirement. Written approval by the thesis advisor, showing that additional work will not interfere with the performance and duties or normal progress in the degree program should accompany the petition. Failure to comply with this employment requirement will result in termination of departmental financial support.

6.5 CONFERENCE TRAVEL AWARDS

Graduate students who are presenting at conferences can apply for funding with Graduate Student Government and the College of Sciences. Information and applications can be found at <http://www.sga.gatech.edu/graduate/conferencefund>

APPENDIX A

Documentation of acceptance into a research group
School of Chemistry and Biochemistry, Georgia Institute of Technology

To the student: Selection of a research advisor requires attendance at the Faculty Seminar Series (CHEM 8901) in the Fall semester followed by discussion with individual faculty members. Complete this form with a faculty member and submit it to the Academic Programs Office by February 1.

Research Advisor Selection

I wish to accept _____ (student's name) into my research program.

He/she will begin a research project in the area of : _____
(provide 3-5 word description)

This project is currently supported by: _____ (provide funding agency)

I expect to support him/her by the following means:

Upcoming Summer GTA / GRA project # _____

Upcoming Fall GTA / GRA project # _____

I have _____ students supported as GTAs in spring (excluding current first year students).

I expect to have ___ students supported as GTAs for the upcoming summer semester.

I expect to have ___ students supported as GTAs for the upcoming fall semester.

Safety Training Requirements for Anticipated Research

In addition to the core first-year Graduate Safety Training Program (Information Security and Protection, Introduction to Chemical Safety, and Introduction to Lab Safety), this student will also complete the following Specialized Laboratory Safety Courses prior to the start of his/her research (selections will be reviewed for appropriateness by the School's Safety Committee).

CHECK ALL THAT APPLY

- Radioactive Materials
- Radiation producing equipment
- Carcinogens and Advanced Toxins
- Compressed Gases and Cryogenes
- Laser safety
- General BioSafety
- Chemical inventory management (Chematix)

Leave blank	
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Signature and date _____ (Student)

Signature and date _____ (Research advisor)

Approved / Declined

Signature and date _____ (School Chair)

Core first-year Graduate Safety Training Program has been completed.

Signature and date _____ (School safety committee)

Specialized Graduate Safety Training requirements have been completed.

Signature and date _____ (School safety committee)

School of Chemistry and Biochemistry
Georgia Institute of Technology

Completion of Data Review

The thesis committee of _____ (student's name) has reviewed research to be included in the thesis, discussed remaining research goals, and approves the student's petition to graduate.

Signatures required:

_____, Thesis Advisor

_____, Chemistry

_____, Chemistry

_____, _____

_____, _____

To Student: Submit this form with your Petition to Graduate to the Academic Programs Office, MoSE 2222L by mid-semester of the semester prior to the semester in which you intend to graduate.

CERTIFICATE OF COMPLETION OF PSE COURSEWORK

Name of Student: _____

Georgia Tech ID #: _____

Home School: _____

Degree objective: _____

Date of matriculation: _____

Expected date of graduation: _____

Thesis title: _____

Please indicate the semester and year when you completed at least four of the following courses (including ChBE/ME 6741 and 6742). Please include the grades that you received.

PSE Course

Semester/Year/ Grade

ChBE/ME6741: Pulp and Paper Manufacture I _____

ChBE/ME6742: Pulp and Paper Manufacture II _____

ChBE 6232: ChE Processes in Pulp & Paper Manuf. _____

ME 6281: Mechanics of paper forming and coating _____

ME 6140: Physical properties of paper _____

MSE 8803L: Environmental degradation of materials _____

CHEM 8833: Pulping and bleaching chemistry _____

Name and Signature (required)

Student: _____ Date _____

Advisor: _____ Date _____

PSE Chair: _____ Date _____

Home School Graduate Coordinator: _____ Date _____

APPENDIX B

GUIDELINES FOR GRADUATE TEACHING ASSISTANTS

GTAs must communicate frequently and effectively with the supervising professor for their assigned course.

- You must provide a detailed schedule to your supervisor so that they can arrange meetings.
- Set a detailed schedule of lab, proctoring, and grading responsibilities from your supervisor(s).
- You must check your mailbox in the main office and your email (including your PRISM account) frequently for messages from your supervisor. You should also seek out your supervisor on a regular basis.
- You must attend all meetings arranged by your supervisor. Be punctual. Contribute to these meetings.
- Meet with your supervisor frequently, at least once per week.
- Be proactive: Ask your supervisor if there are any duties which need attention.

In all duties as a GTA, you must understand the material covered in the course. You must take measures to understand the material by reading the textbook, attending lectures and by discussion with your supervisor.

If you have an unavoidable time-conflict with an assignment, you must inform your supervisor (the lab coordinator for lab assistants, or lecturer for conflicts with homework and exam grading). You must arrange with you supervisor to either reschedule an assignment or find a mutually agreeable replacement to fulfill your duties. GTAs should not “swap” duties without consulting the supervisor. Although senior GTAs might be given extra responsibilities, and might be asked to mentor junior colleagues, they do not have supervisory roles over other GTAs.

You must perform all duties associated with your assignment in a timely and professional manner. This includes all responsibilities for preparation of laboratory activities, staffing of laboratory sections, proctoring, grading, recitation and office hours.

- Proctoring requires careful attention to the needs of students. In addition, you must be alert to observe any action which constitutes academic dishonesty. These should be reported to the supervising professor.
- Grading requires careful evaluation of each piece of work submitted. Your grading must be fair to all students. Grading must be at an appropriate standard; you must know the expectations of your supervisor and when it is appropriate to award partial credit.

- If you are teaching recitation sections or providing office hours, find out from your supervisor what should be covered. In general it is not appropriate to simply provide answers to assigned questions. Engage the students in a dialog to develop concepts, problem solving approaches, etc. Use recitation time and office hours efficiently.
- Teaching in the laboratory requires careful attention to issues related to safety. You are responsible for the safety of students in the laboratory. You must adequately alert students to potential hazards. It is a policy of the School of Chemistry and Biochemistry to require eye protection in *all* laboratories at *all* times. It is your responsibility to enforce this policy. If students are not wearing eye protection they are required to leave the laboratory. Failure to enforce safety guidelines constitutes unsatisfactory performance of your teaching duties.
- If you are responsible for preparation or supervision of a laboratory activity, you must develop experience with the technique. GTAs supervising students in a laboratory activity are responsible for solving problems encountered with equipment and samples. Whenever appropriate, the laboratory supervisor should be consulted. Organization of each individual laboratory activity is the responsibility of the GTA under the direction of the supervisor.
- GTAs are responsible for preparation and clean-up of the laboratory at the beginning and end of each laboratory period, and at the start and end of each semester. Generally, you should have students tidy up their work areas at the end of each laboratory period. However, at the end of the laboratory session there is usually a need for additional tidying.

GTAs, laboratory coordinators and supervising professors constitute a unit which works together to provide a safe, nurturing and stimulating environment for students. This team will maintain an atmosphere of mutual respect in all aspects of their interactions with each other and with students.

- All students should be treated with respect and courtesy. However, you must also maintain your authority over the class, and command the respect of your students.
- Other GTAs should be treated with respect and courtesy. They have the same responsibilities as you. They should be consulted whenever appropriate.
- Laboratory coordinators should be treated with respect and courtesy. They have supervisory responsibility for all aspects of the laboratory. They should be consulted whenever appropriate. You should be responsive to the laboratory coordinator's directions.
- The supervising professor should be treated with respect and courtesy. They have supervisory responsibility for all aspects of the course. They should be consulted whenever appropriate. You should be responsive to your supervisor's directions.

GUIDELINES FOR GRADUATE RESEARCH ASSISTANTS

A Ph.D. is *earned*, not awarded, on the basis of an independent body of work. The earning of a Ph.D. is a complex process, in which you bear the primary responsibility. You are given a high degree of independence in a project. It is your job (1) to become familiar with the literature in the area; (2) to determine through that examination if the work is really new; (3) to turn that germ of an idea into a project in which you bring your own ideas and your own critical thought; (4) to execute experiments which test that idea; (5) to generate new experiments *on your own* which allow you to bring that idea to fruition in a completed research project. Also, students are welcome to develop their own projects.

1. **Thesis.** The thesis should have a beginning (background), a thesis (description of rationale for experiments based upon background), a description of the experimental data, and a discussion of the conclusions based upon that data. It should have *complete* references and background which document that this is a new piece of work. It should have detailed description of experiments which confirm *beyond doubt* the claims made, allow an independent investigator to reproduce the experiments described and confirm the identity of the materials or data produced.
2. **Publications.** A good thesis should lead to 3-4 publications. Ideally, at least 2 of those should be accepted before you leave. Also, publications give you thesis chapters. The main difference between publication writing and thesis writing is that the level of detail in the latter is not allowed in the printed form.
3. **Notebook.** The primary source for the experimental part of the thesis is a well-written and complete notebook. Neatness counts less than completeness. Data should never be written on scraps of paper for later transcription. The notebook should be dated regularly, and work of potential patentable nature should be countersigned by a labmate and dated. Crude weights and pure weights should also be taken of all reaction products and starting materials. All liquids should be measured or reasonable estimates provided if the volume is not critical.
4. **Spectra.** Spectra (ir, nmr, ms) are obviously taken of all new compounds. However, it is almost always a good idea to take spectra of crude reaction mixtures after solvent removal. This avoids problems later on when chromatography or other subsequent separation attempts lead either to disappearance of materials or to rearrangement on columns. Also, this helps to solve problems of poor mass balance. The spectra should be clearly labeled as to their origin and a *notebook reference should be provided*. The scales, to the extent possible, should be kept standard so that other spectra can be compared. You should develop a habit of storing all your spectra (especially of the “final”, purified compounds) in an electronic form. That will allow you to manipulate them later for display purposes.
5. **Reports.** Semesterly reports are often required. The purpose of these is to serve as intermediate stages to the publication and/or thesis. Good reports save you a tremendous amount of work at thesis time, because they remind you of missing data

and experiments that are difficult to perform later. They also force you to examine the literature to make sure you are not reinventing the wheel! The quality of your reports should be that you can simply “cut and paste” them into your thesis.

6. **Hours.** Graduate school is probably the last opportunity you will have for flexible hours. Don't abuse the privilege. Forty hours a week is a minimum. A good graduate student works nights and weekends. Sometimes you need a vacation and you should take it. You should consult with your advisor if considering vacation. However, the primary issue is not hours but work. A good Ph. D. student should complete one experiment per day. Because experiments generally involve reaction times, work-up, analysis, etc., this means you generally need to be doing multiple experiments.

Items 1-6 involve personal responsibility. However, earning a Ph. D. is an apprenticeship, which means you learn from others. Creativity and individuality are crucial in becoming a good researcher. As much as it is important to challenge the accepted status in science, there are rules and regulations of the workplace which must be followed in order for other researchers to be able to conduct their work efficiently. Therefore, for a common good, your individuality must take a back seat here. Do not be afraid to ask questions if you are unsure! Everyone is there to help you. Since this requires a high degree of collegiality, there are some obligations on your part to the rest of the group:

7. **Fix it!** Especially if *you* break it, get it fixed. If an item of equipment is broken, even if you are not responsible, take steps to get it fixed. If there is a person assigned to the equipment, notify him or her. If you are the person assigned to a piece of equipment, keep it in good running order at all times.
8. **Clean it!** Even on your bench, accumulating dirty glassware is a safety and health hazard. A messy work area is unacceptable. If you have a spill and do not clean it promptly, *you are knowingly exposing others to danger*. ONLY YOU know what is you left on/around the balance, rotavap, other equipment and how to **properly** and **safely** dispose of it (solvents left on a rotavap, vacuum line traps - for example). Areas around equipment (and computers) are for everyone to use. Your experiment must be contained to those work areas. They need to be thoroughly emptied and cleaned upon completion of your experiments, so that the next user does not have to guess about safety of the stuff you left behind. Areas around computers need to be uncluttered, so whoever needs to use them, can do his/her work efficiently. Make sure you have removed all of your materials: notes, spectra, etc. when you are finished.

Where needed carts are provided to serve as working benches; you can prepare your experiment in your lab and then take it to the equipment you use. These carts need not be used for other purposes/removed from the assigned area.

Since all the research laboratories in the Boggs building are subject to the safety inspections by internal as well as external persons, there comes the time, where our labs need to be cleaned/reorganized, and all the group members must feel responsibility to contribute. It is important, that you participate in these activities.

9. **Label it!** Never put an unlabeled flask in the refrigerator. Make sure labels are securely fastened, generally with tape. Use only dark ink on the labels.
10. **Order it!** If you use the last of the group solvent, order more. If you use the last tlc plate, order more. If you break something that can't be fixed, replace it.
11. **Return it!** When you need to borrow something, ASK FIRST! If the person is not available, take a few moments to write a note. If nothing else, common courtesy calls for returning what you have borrowed as soon as possible. Returning an empty chemical bottle or a piece of glassware that is less than impeccably clean- is not good enough! Tools, cuvettes, and other common equipment should be returned to their storage place immediately after use.
12. **Enforce good security.** Challenge people walking the halls after hours. Ask for identification. Don't be afraid to demand their reasons for being in the building. Call the police if someone refused to provide that identification. Lock the lab door if you are leaving and no one is left, and check the other doors.
13. **Safety habits.** YOU, and OTHER PEOPLE as well, have a RIGHT to work in a SAFE environment. YOU MUST NOT, BY YOUR CARELESS ACTIONS/ NEGLIGENCE ENDANGER OTHER WORKERS. YOU have the RIGHT to DEMAND - other people in their work observe proper safety procedures.

You should know the properties of the chemicals you work with. Especially important is that you are aware of health hazards they may pose. If you don't know, always assume that the chemical is a health hazard. Therefore make sure you package all the chemicals that you store in the lab properly, in closed bottles/flasks/jars, clearly labeled (see **Label it!**). Remember, MAKE SAFETY A PRIORITY!

GUIDELINES FOR PRESENTATION OF CHEM 8903 STUDENT SEMINAR

The Graduate Seminar serves two purposes that are very important for the doctoral student's scientific career development in science:

- To give graduate students an opportunity to demonstrate breadth of knowledge within their sub-discipline of chemistry, and
- To give graduate students practice in developing strong oral communication and presentation skills

With these general goals in mind, each Graduate Seminar should cover important, high-quality, recent progress in an area of chemistry or biochemistry. The following criteria should be met when selecting a topic and journal article(s) on which to base the talk:

Seminar topics are subject to approval by the evaluator for the course. Topic changes are strongly discouraged once approved. If you wish to change the topic of your seminar, this should be done in consultation with the evaluator for the course.

Since the Graduate Seminar is intended to give graduate students an opportunity to demonstrate breadth of knowledge in chemistry and practice in developing strong oral communications and presentation skills, each seminar should cover important, high-quality, recent progress in an area of chemistry/biochemistry.

Requirements for the seminar topic:

- Cutting-edge and contemporary research (within the last 5 years)
- NOT related to the graduate student's research (unless approved by the course instructor)
- NOT work done at Georgia Tech
- NOT work done at the presenter's undergraduate (or previous graduate institution)
- NOT research presented in a seminar over the last two academic years.

The quality of science is usually related to the quality of the journal in which the work is published. However, we realize that some cutting-edge work may not be mainstream enough to merit publication in the more highly recognized journals at the beginning stages of development. To avoid gross discrepancies in the quality of information being presented across disciplines in the Graduate Seminar course, the instructor has composed a list of reputable journals that faculty within the School of Chemistry and Biochemistry have approved as appropriate. The journals are listed under the "JOURNAL LISTINGS" link on the home page for this course.

There are numerous types of journal articles published today. Some are very short (i.e. 2-4 pages) while other are very long (i.e. review articles that are the length of book chapters). The

expectation for the Graduate Seminar is that students select full research articles (generally 5-

12 pages in length) as opposed to communications, letters, etc. If necessary, students may select one short paper as a primary reference for his/her talk.

References

Each Graduate Seminar should be based on work described in primary research articles. However, additional references may be reviewed for development of general information and for citation in the presentation itself. However, data being presented should come from the primary research articles.

Presentation Guidelines

Each Graduate Seminar should be a PowerPoint-styled multimedia presentation. Each presentation will be timed and penalties for exceeding the 1-hour limit or for grossly falling short of the time limit will be imposed to the discretion of the evaluator. A general rule-of-thumb is that there is one slide covered per 1-2 minutes when speaking at a moderate pace. Detailed guidelines for preparing for the seminar, preparing the slides, and presentation of the seminar are described in the PRESENTATION GUIDE linked to the home page for this course. The information presented there is not exhaustive, but rather is meant to be a starting point for preparing a talk that can be well received.

Audience members are permitted to ask questions during the Graduate Seminar. This is important for clarity and for development of skills in interacting with the audience.

Presenters

should be prepared for interruptions, but should still exercise control over the presentation with respect for the audience members. Time has been allotted at the end of each presentation for audience feedback that will be collected in writing and transposed at a later time to maintain anonymity among the responders. The feedback will also serve as a record of attendance at the Graduate Seminar for that day. (Completion and submission of an Audience Feedback Form for someone other than yourself is considered a violation of the Georgia Tech Honor Code.) The evaluator will also give each presenter direct feedback before the end of class; the purpose is to serve as constructive criticism and not public humiliation.

Attendance and Grading

Attendance and grading policies will be determined by the course instructor as stated in the course syllabus.

Assistantship Accommodations arising from Medical Needs

The following guidelines allow a graduate student to maintain full-time status and assistantship support when they are unable to perform their regular balance of academic, teaching, and research activities for more than three weeks due to medical needs or childbirth (including routine prenatal care and care of a newborn). Accommodations for periods of less than three weeks are to be made within the existing framework of Research and Teaching Assistantships in conjunction with the supervisor. Accommodation for longer periods may be made by redefining the activities associated with the student's assistantship, which may include modification of the balance between instructional and research activities. Certification from an appropriate medical professional is required in all cases other than pregnancy/childbirth/newborn care. Students who make use of these policies may request a one-semester delay for any remaining academic requirements (e.g., candidacy exam, seminar).

In all cases, the student should initiate discussions with his/her advisor and the Associate Chair for Academic Programs as soon as possible. For accommodations related to pregnancy, childbirth and care of a newborn, this discussion should take place at least five months before the expected delivery. Discussion related to other medical conditions should take place: (i) as soon as possible following a diagnosis (or development of a planned course of treatment), or (ii) as soon as is reasonable after hospital admission in the case of a medical emergency.

The discussion between the student, advisor and Associate Chair will focus on defining duties to be conducted during the time of accommodation while: (i) maintaining full-time student standing, and (ii) maintaining full assistantship support. Assistantship support will be provided as a combination of funds from the research advisor and School, reflecting the balance of duties to be performed.

Related policies and procedures

“Incomplete” course grades. Students registered for classes should consider the Institute's policies regarding the assignment of a grade of “Incomplete” and how course requirements will be completed upon returning to a regular academic schedule.

Unpaid leave of absence. A student who wishes to take an unpaid leave of absence either after or in lieu of these accommodations may do so. Readmission after more than one semester requires a petition to the faculty (by Institute regulations), which will be approved by the School provided the student left in good standing.

External Fellowships. A student who has continuing fellowship support from external sources should be aware of any obligations to the external sponsoring agency. If the student is unable to fulfill the requirements of the fellowship during the period of accommodation s/he may be appointed as a Graduate Assistant at the regular assistantship level for that period.