

# ***GRADUATE STUDENT HANDBOOK***

**Department of Chemistry &  
Biochemistry  
The University of Alabama**

**Revised August 2019**

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## PREFACE

### TO THE ENTERING STUDENT:

This Handbook will acquaint you with the regulations, requirements, and procedures of the graduate program in Chemistry & Biochemistry at the University of Alabama. The Handbook covers information that should facilitate your smooth progression through the various degree requirements. The Appendices contain information to assist you in monitoring your progress towards the doctoral degree. In addition, Appendix E contains emergency procedures and safety regulations for working in the laboratory.

Many other publications delineate the University's specific regulations, requirements and resources. The "Graduate Catalog of the University of Alabama" is the official statement of the Graduate School's policies, degrees, requirements, and course offerings. This Handbook is not a substitute for any of these publications but augments them with a presentation of the official Department of Chemistry & Biochemistry graduate degree requirements and policies.

The current Graduate Catalog and this Handbook constitute the rules and regulations to which you will be held responsible when your final degree check for graduation is performed. *Remember, as the interested party, it is your responsibility* to ensure that all program requirements are met in a timely fashion and that the proper forms are obtained, completed, and submitted.

## LETTER FROM THE CHAIR

Dear New Chemistry Graduate Students:

On behalf of the faculty and staff of the Department of Chemistry & Biochemistry, I am pleased to welcome you to The University of Alabama and to the Department of Chemistry & Biochemistry. The contents of this handbook are intended to acquaint you with appropriate departmental procedures, course requirements, expectations we have of you in performing your teaching and research duties, and departmental safety rules and emergency procedures. You need to read this material carefully. It is especially important that you understand the safety rules and procedures and follow them.

Upon your arrival, you should stop by the Department Office (Shelby 2005) to check that all relevant employment paperwork has been completed. This includes the federal and state tax withholding forms and the Employment Eligibility Verification I-9 form. All of these must be completed and signed in order to be paid.

You have been given the schedule of the placement examinations. Your performance on these examinations helps us to develop an appropriate program of study for you based on your past experience. The Graduate Committee will provide a recommended initial program to you after your completion of these examinations.

You will be assigned a box in the mailroom. You should visit it daily to make sure that you do not miss any announcements. It is located on the second floor (2003) next to the Main Office.

The Department of Chemistry & Biochemistry's address is:

Department of Chemistry & Biochemistry, The University of Alabama, Box 870336,  
Tuscaloosa, AL 35487-0336.

The overnight or express mail address is:

250 Hackberry Lane, Department of Chemistry & Biochemistry, The University of Alabama,  
Tuscaloosa, AL 35401.

Prof. Patrick Frantom is the Director of Graduate Studies for the Department and is located in Shelby 3097B, email: [pfrantom@ua.edu](mailto:pfrantom@ua.edu) . He will handle any issues with registration and general issues that you might have. Teaching assistantship assignments will be made by the Undergraduate Director, Prof. Michael Jennings, Shelby 2076, email: [jenningsm@ua.edu](mailto:jenningsm@ua.edu). If you are on a research fellowship, please see your research director. Any questions to do with financial

matters should be brought up with Ms. Arnold, Shelby 2008. Please see Prof. Frantom or me about any other questions that you may have. The Chair's secretary, Ms. April Rice, is in Shelby 2006, phone: 205-348-8436, email: [aerice3@ua.edu](mailto:aerice3@ua.edu). Please see her to make an appointment with me, if necessary.

We are excited to have you join UA's Chemistry family. The University of Alabama and the Department of Chemistry & Biochemistry are growing and improving in quality, and you are an integral part of making that happen. Graduate school is a time to expand your scientific background and professional horizons, to learn how to be a lifetime learner, and to grow personally. It is also the time to make the transition from undergraduate to professional, and we expect you to act professionally in your duties and in your actions. This is important as you are often the face of the University seen by our undergraduate students. We want to give you the opportunities you need to be successful in your chosen career in chemistry. Please let me know what I can do to help make your stay here both professionally and personally rewarding.

Sincerely yours,

Dr. Greg Szulczewski  
Associate Professor and Chair, Chemistry & Biochemistry

## I. Graduate Appointments (Teaching and Research Assistantships)

### A. The Graduate Appointment

Graduate students are most commonly supported as “full” Graduate Teaching Assistants or Research Assistants. **The Graduate School requires that any student past their first 12 credit hours of coursework must maintain a grade point average (gpa) of  $\geq 3.0$  to hold an assistantship.** Students must sign a Memorandum of Appointment (MOA) to accept an offered TA and/or RA position. Students are free to decline the offer of any assistantship but will become responsible for paying tuition (either by fellowship or personal/family funds).

Graduate appointments are normally 0.5 FTE (full-time equivalent) commitments and should require roughly 20 hours per week. **However, graduate study requires a full-time commitment on your part. Considerable additional time ( $\geq 20$  hr per week) must be devoted to academic work including coursework, seminars, and research.**

### B. Holding Jobs Outside of the Department

The Department of Chemistry & Biochemistry regards its teaching and research assistantship stipends as an aid to the graduate student’s education as well as payment for specific services rendered. To make satisfactory progress toward your degree, you must devote substantial time to your coursework, research, and other degree requirements. **Therefore, graduate assistants are not allowed to hold outside jobs or to receive other remuneration for services rendered without written permission from the Director of Graduate Studies.** This includes the operation of independent enterprises such as online businesses.

### C. Tutoring

Tutoring aids graduate students in learning chemical subject matter more thoroughly. Thus, tutoring is allowed with the agreement of your research advisor. **To be added to the Department’s list of tutors, you should complete the request form, obtain your advisor’s signature, and submit to the graduate program assistant.** The Department will not endorse or recommend specific tutors to undergraduate students. Details such as hours and fees are left to the individuals to negotiate. **Time spent on tutoring must not impinge on the normal activities expected of full-time graduate students and should be limited to a maximum of five hours per week.** Paid tutoring of students in a course to which you are assigned as a TA is not allowed, nor may you charge for tutoring during TA office hours.

### D. ITAP Accreditation (International students only)

**International students with non-US degrees are required to gain accreditation by ITAP (International Teaching Assistants Program) within their first year as a TA to qualify for future TA support.** This requires taking assigned ITAP courses and passing the ITAP exam.

## **E. Background Checks and Training**

**All graduate students receiving paychecks from the University of Alabama must first clear an Employment Background Check administered by the Graduate School.** These checks are intended to provide information regarding past serious issues that might affect interactions with the UA community (felony convictions, sex offender status, etc.). Potential graduate student employees are required to sign a release form providing permission for the check. Any issues raised by the check are subject to review by a committee that includes representatives from the Graduate School, the College of Arts & Sciences, UA Department of Public Safety, and Student Affairs. Graduate students will have the opportunity to respond, rebut and explain any issues that arise. Note that beyond collecting release forms for the Graduate School, the Department of receives no knowledge of these proceedings beyond access to a student's status.

In addition to this initial background, **the College of Art & Sciences requires that all graduate students receive periodic training regarding their legal responsibilities while interacting with the University community.** At the beginning of your first year in residence, this training can be satisfied by documented attendance at the A&S Legal Training Workshop. Refresher training will be required by the College every two years.

**The Graduate School requires that all teaching assistants complete the Teaching Assistant Workshop** which is offered annually in August. January admits can hold TAs in Spring and Summer but should plan on attending the next available workshop to qualify for further appointments.

## **F. Vacation Time and Holidays**

Graduate students are normally afforded one week of vacation per year. Students traveling long distances may forego vacation time in one year and take multiple weeks in a subsequent year. The vacation period should not occur when Fall/Spring classes are in session. For vacations planned in the Summer semester, TAs must consult with the Director of Undergraduate Studies before arranging travel to ensure that the vacation time will not conflict with summer term TA duties. **All vacations must be approved by the student's research supervisor.**

Remember, students are expected to work full time in the program; times when classes are not in session are prime periods for research and for working on other degree requirements.



## II. Responsibilities and Duties of Teaching Assistants in Chemistry

The following comments are general statements of policies and duties of teaching assistants in the Department of Chemistry & Biochemistry.

- **The teaching assistant is expected to display the utmost integrity and professionalism in dealing with the students.**
- **It is against Departmental policy for a TA to fraternize with his/her students either during school hours or after.**
- **Paid tutoring of students in a course to which you are assigned as a TA is not allowed, nor may you charge for tutoring during office hours held as part of your teaching assignment.**
- **The UA Policy on Confidentiality of Records recognizes the privacy rights of students in matters such as the posting of grades and release of information about students, as outlined in the Family Educational Rights and Privacy Act (FERPA) of 1974 and in subsequent amendments.**

### A. Laboratory TA

Most TA appointments involve instruction of students in laboratory courses. **The functions of the laboratory teaching assistant are to provide instruction, supervision, and assistance, as required, to the students in his/her section. The proper performance of these duties requires the undivided attention of the teaching assistant during each laboratory period.**

Specific policy details concerning the operation and maintenance of the laboratory will be formulated by the faculty and administered by the teaching assistants under the direction of the faculty and the laboratory supervisor. It is the responsibility of the teaching assistant to become thoroughly familiar with the policies and procedures of the chemistry stockroom, to support these policies, and to work within these procedures in his/her dealings with the students in his/her laboratory sections.

Prior to the beginning of the laboratory period, the laboratory and equipment rooms should be inspected to make sure they are clean and orderly. A check should be made to ensure that all the required reagents, equipment and supplies are available and in sufficient quantity. If the preceding section did not leave the laboratory in the proper condition, this condition should be reported to the laboratory coordinator or faculty member in charge of the laboratory. During the early part of the laboratory period, the teaching assistant should determine that each student has the necessary equipment and that it is assembled properly. The TA should

circulate through the laboratory during the period to determine that each student does the assigned work in an acceptable manner, and to answer any questions which the students may ask. Do not rely on the student to come to you for questions. Finally, no student should be permitted to leave the laboratory until his/her work has been completed (including cleanup) to the satisfaction of the TA.

The number of students in each laboratory section is set according to recommendations of the American Chemical Society and UA Fire Safety policies so that the TA will be able to devote his/her personal attention to individual student problems. **Department policy requires all people in a teaching lab to wear approved safety goggles at all times; this includes students, TAs, staff and faculty! As the person supervising the laboratory, it is your responsibility to enforce this rule.** Departmental policy is that no student will be permitted to smoke, eat, or drink beverages in the laboratory. Furthermore, operation of electronics and cell phones is not permitted. **The TA is likewise expected to observe these policies.** Specific safety rules for the laboratory will be given to the students on the first day of the lab meeting. The TA must not leave the laboratory while he/she has a lab in session unless he/she has the permission of the supervisor or the professor in charge. At all times, the laboratory students and their safety must have the full attention of TA. Nobody other than students registered for the lab section should be allowed in the laboratory without permission of the lab supervisor.

**Graduate students should inform the course/lab supervisor if they must miss any part of the assigned TA duties, and this should be done as far in advance as possible. TA's are encouraged to arrange for other graduate students to cover missed assignments, but such arrangements must be approved by the supervisor in advance.** During weeks when labs do not meet, the TA may be expected to help try new experiments that may be adopted in future courses and/or demonstrate that he/she has practiced the labs that he/she will teach for the semester. Failure to perform this aspect of the TA duty may result in loss of pay. Other special assignments by the lab coordinator may also be requested in weeks when the lab is not in session.

## **B. General Chemistry Laboratory TA's**

A 0.5 FTE TA requires twenty (20) hours of work per week. Typically, three hours (3) are spent for each general chemistry laboratory section, and a typical TA load is three sections. About three (3) hours should be spent grading lab reports each week. The TA is also expected to attend a weekly meeting that is designed to review grading, planning for the experiment in the following week, and/or training sessions. One (1) hour per week is spent in a room (to be designated) to help any 100-level Chemistry student that may need assistance. The TA should

set two (2) office hours and make himself/herself available on a reasonable basis to his/her students who wish to see him/her concerning their laboratory work. The balance of the work load includes periodic safety training and may also include any request by the lab coordinator or Director of Undergraduate Studies.

### **C. Upper Level Laboratory TA's**

TA's for 200~500-level laboratories (quantitative analysis, organic, physical, instrumental analysis, and biochemistry) also require twenty (20) hours of work per week. The breakdown of contact time in the laboratories, preparation time, grading, staff meetings and office hours will be determined by the instructor of each laboratory course. Furthermore, additional time may be required to become familiar with the operation and execution of each laboratory experiment. In all, TA's should average no more than 20 hours per week of effort.

### **D. Other TA Assignments**

As needed, graduate student TA may be assigned to other duties including laboratory preparation, proctoring, leading recitations, course development. **All of these assignments are important and require the same diligence as a lab TA assignment.** For example, a reagent solution prepared incorrectly can negatively affect the laboratory experiences of hundreds of students. As with other TA appointments, the effort should average no more than 20 hours per week.

### III. Graduate Student Academic Policies and Requirements

In addition to the general requirements of the Graduate School, the following departmental rules and regulations apply:

#### A. Scholastic Requirements

**The student must maintain a cumulative average grade of not less than “B” (3.0) in graduate courses taken at The University of Alabama to be eligible for renewal of either a teaching or research assistantship.** Courses in which a student has earned a grade of “P” are not considered in making evaluations of academic standing. Graduate students will be permitted a maximum of 2 grades of less than “B” in lecture courses. **Regardless of grade point average, receiving three grades of “C” or failure in any course (“D” or “F” grade) will result in a review of the student’s performance by the Graduate Committee.** This review will **determine whether the student will be allowed to continue in the graduate program** and will occur prior to registration of the student in any subsequent term of study.

#### B. Placement Examinations/Assessment Baselines

Diagnostic examinations covering the traditional areas of chemistry (general, analytical, biochemistry, inorganic, organic, and physical) are used by the Graduate Committee for advising/placement and are used as data for program assessment purposes. All students will take a general chemistry exam. In addition, each student will choose two area exams in the disciplines most closely related to their research interests.

#### C. Enrollment Policies for Graduate Teaching/Research Assistants

The following is a summary of the current graduate school policies regarding course loads for all teaching assistants and research assistants. Note that a “full” TA or RA is a 0.5 FTE (full time equivalent) appointment. When considering enrollment, students and advisors should also consider the degree requirements (see sections IV and V).

#### Enrollment Guidelines

##### 1. General

Graduate assistants must be full-time graduate students during academic semesters (Fall & Spring) in which they receive financial assistance from the University. **Students holding “full” TA and/or RA appointments (0.5 FTE) should register for ≥6 credit hours.**

Under-enrollment will usually only be allowed in the final semester in the program. A suggested registration schedule can be found in Appendix C (page 35).

A fellowship, as a non-service award, is outside the scope of these policies. Under the terms of their appointments, graduate fellows are required to undertake full-time graduate study ( $\geq 9$  hr per semester).

**Once a doctoral student has achieved “candidacy”, they must register for a minimum of 3 credit hours of dissertation research (CH699) in every Fall/Spring semester.** During the semester of their dissertation defense, the Graduate School permits students to enroll for as few as three credit hours. Under some circumstances, a student completing their dissertation after the semester’s deadline for graduation may be able to register for reduced hours. Note that the visa requirements for international students generally do not permit under-enrollment.

## **2. Summer Session**

**Students are not required to register/enroll in Summer** provided they were enrolled in the preceding semester and will be enrolled in the following Fall. Summer enrollment is not required to maintain full-time status, health insurance coverage, and immigration status. Generally only students who require summer registration for graduation will enroll. Students should consult with their faculty advisor and the Graduate Director to determine whether to register.

## **3. Exceptions**

Exceptions to the rules described above must be approved by the Director of Graduate Studies.

## **D. Policy of Financial Support**

Department admission letters describe a specific offer of financial support. Generally, incoming students are offered a TA position for the first year and may be moved to RA support (paid from faculty contracts or grants) at the discretion of the faculty mentor and depending upon the availability of funds. While any student in good standing may hold an RA appointment, only PhD students in years 1-5 and MS students in years 1-2 are normally eligible for TA support.

**All students must remain in good academic and programmatic standing to qualify for support. Good standing means maintaining a graduate GPA  $\geq 3.0$ , meeting the program requirements in a timely fashion. In addition, unsatisfactory teaching or research performance can result in termination of student financial support.**

## E. Selection of a Research Project

1. Faculty members will present their current research during the early part of the fall semester.
2. Students are required to interview no fewer than four faculty to discuss available research opportunities. The signatures of each interviewed faculty member should be collected on the “Choice of Research Advisor” form.
3. Students may select research groups at any time after completing steps 1 and 2. Each student will list their top three choices for advisor and will choose a major area of study in chemistry. Placement will occur after all selection forms have been submitted (late November). The student will be informed of their placement after consent of the advisor and the Director of Graduate Studies has been obtained.
4. **Students are “free agents” until placement is finalized.** Students are encouraged to spend time in the labs of potential advisors prior to placement. This can allow for a better-informed choice of group as well as providing an early start to a research project. However, while such arrangements will be considered in the placement process, they do not guarantee assignment to a specific research advisor.

## IV. Degree Requirements for the Ph.D. in Chemistry

### A. Undergraduate Prerequisites for Graduate Study

Graduate students in Chemistry are required to have passed a minimum of 2 semesters of organic chemistry, 1 semester of organic laboratory and 1 semester of physical chemistry as part of their undergraduate curriculum. Students admitted without these courses will be required to make up the deficiencies with the appropriate survey course.

### B. Course Requirements (for graduate school requirements, see catalog)

A minimum of 48 semester hours of course credit, including formal lecture, seminar and research techniques courses, is required for the Ph.D. Of these credit hours, a maximum of 20% may be pass/fail courses. The remaining credit hours must be taken for a letter grade, and a GPA  $\geq 3.0$  must be maintained overall. In addition, a student is required to complete no less than 24 hours of dissertation research (CH 699, NOT thesis research, CH 599, which counts only for M.S. students).

**NOTE:** Each student should be advised by the graduate committee or his/her research mentor prior to course registration for all semesters in residence.

#### 1. Formal Lecture/Laboratory Courses (departmental requirement)

**Ph.D. students are required to take six (6) lecture courses: four formal lecture/lab graduate courses in a major field and two formal lecture graduate courses in areas outside their major field.** These courses should be selected so that upon their completion the student will have the necessary tools to perform and make original contributions to his/her dissertation. This minimum course requirement has been established on the assumption that the student has completed a B.S. degree in chemistry (with at least 32 semester hours of chemistry coursework) and has undergraduate grades to indicate that he/she has a good grasp of the subject matter.

If undergraduate preparation and/or placement exam performance indicates that the student is weak in one or more of the areas planned for graduate study, then the student is urged to consider taking the appropriate survey course(s) first. The courses which are normally offered include:

- (1) Analytical Chemistry Survey - CH521 (Spring semester)
- (2) Inorganic Chemistry Survey - CH 501 (Fall semester)
- (3) Organic Chemistry Survey - CH 530 (every semester)
- (4) Physical Chemistry Survey - CH 540 (Fall semester)

Note that survey courses do not count toward the required six formal lecture courses except for CH 501, which may be used by all except inorganic majors.

## 2. Schedule for Completing Required Courses

**Doctoral students will normally finish lecture courses within their first four academic semesters.** This means that first year students will take two lecture courses per semester, and the final two courses will be completed in the second. The remaining credit hours will be seminar and research techniques courses.

## 3. Withdrawing from Courses

**Students are not allowed to drop graduate courses without permission of the Director of Graduate Studies. Students who want to petition to withdraw from a course should immediately contact the Graduate Director.**

## 4. Courses in Major

Each student must take the core course(s) in his/her major area. A list of major courses (with core courses designated \*) for each major area is given on the following page:

### Graduate courses according to major area (updated Spring 2019)

\* required course in the major area

† course can count in more than one area

#### Analytical courses:

CH 524	Spectroscopic Methods of Analysis
CH 526	Chemometrics
CH 605	Special Topics in Inorganic Chemistry—X-ray Crystallography †
CH 621	Current Trends in Analytical Chemistry--Electrochemistry†
CH 626	Surface Analytical Techniques †
CH 627	Mass Spectrometry

#### Biochemistry courses:

CH 561	Biochemistry I
CH 562	Biochemistry II *
CH 563	Biochemistry Lab
CH 564	Biophysical Chemistry †
CH 565	Bioinorganic Chemistry †
CH 566	Bioorganic Chemistry †



Inorganic courses:

CH 501	Introduction to Graduate Inorganic Chemistry ( <i>does not count for inorganic majors</i> )
CH 565	Bioinorganic Chemistry †
CH 601	Structural Methods *
CH 605	Special Topics in Inorganic Chemistry—Polymer
CH 605	Special Topics in Inorganic Chemistry—X-ray Crystallography †
CH 609	Organometallic Chemistry †

Organic courses:

CH 505	Medicinal Chemistry
CH 531	Physical Organic Chemistry *
CH 532	Synthetic Organic Chemistry *
CH 637	Organic Spectroscopy *
CH 566	Advanced Bioorganic Chemistry †
CH 609	Organometallic Chemistry †
CH 635	Special Topics in Organic Chemistry

Physical courses:

CH 541	Adv. Physical Chemistry I: Kinetics and Statistical Thermodynamics *
CH 549	Adv. Physical Chemistry II: Atomic and Molecular Structure *
CH 621	Current Trends in Analytical Chemistry--Electrochemistry†
CH 626	Surface Analytical Techniques †
CH 643	Quantum Mechanics
PH 534	Digital Electronic and Computer Interfacing
PH 591	Advanced Laboratory
ChE 651	Statistical Mechanics and Multi-Scale Simulation Methods

**Note:** Students may count courses not listed on the previous page. In these cases, the advisor will request (in writing) that the Graduate Committee count a course. This petition should briefly describe the student's situation including how the new course will enhance the student's studies. The Committee will then vote to accept or decline the petition or to request additional information. The student is then responsible for collecting the information which can include a copy of the course syllabus of and/or a detailed rationale for counting the course, including how it fits into the scientific curriculum and its impact on the student's research work.

## **5. Courses outside Major**

Students are expected to take two courses outside their major to strengthen and broaden their backgrounds. The student should consult with the Graduate Committee or his/her Research Advisor in the selection of these courses. Courses offered outside of the Department of Chemistry & Biochemistry must be approved by the Graduate Committee using the process described above.

## **6. Exemptions from Formal Coursework/Transfer of Credits**

Students who have already passed equivalent courses may request to transfer up to two of the six required lecture courses. A maximum of one course may be in the major area.

## **7. Seminars**

Development of written and oral communication skills fulfills an important professional function: chemists are often called upon to give written and/or oral reports of their research work or the work of others. These presentations and the discussions that follow provide one of the most important avenues of communication in science. It is, therefore, necessary to learn how to communicate and to benefit from the ensuing discussions.

### **Chemistry Seminars, CH 585**

**Graduate students must register for Chemistry Seminar (CH585) every Fall and Spring semester. Exceptions will be made for students who are not on campus or have conflicts between assigned teaching duties and seminar times; these must be approved in writing by the Graduate Director.**

Grades are to be based on attendance at Departmental seminars and graduate student research presentations. For attendance to count, students must (1) arrive on time, (2) personally sign the attendance sheet, and (3) stay until the end of the lecture (including question/answer times at the end of the talk). Assigned grades will be based on the percentage of seminars attended on the following scale:

100-85% A, 84-70% B, 69-55% C, 54-40% D, 39-0% F

The "total number" of seminars in a given semester will be determined based on the number of all scheduled departmental seminars and graduate student research presentations on the published "last day to drop a course with a W". Seminars added to the schedule after this date will not increase the total number of seminars for grade purposes, but attendance will be recorded and count toward the course grade.

### **Literature and Communication in Graduate Chemistry, CH 584**

In the Fall of the second year, graduate students must register for the Methods in Chemistry Research course (CH 584). This 3-hr course will focus on the development of skills necessary to research and critically analyze the chemical literature and to effectively communicate information in written and oral presentations. **Students who do not earn a A or B grade in this course will be required to repeat the course at the next earliest opportunity. A second failure to earn a passing grade would constitute inadequate progress toward the degree and trigger dismissal from the graduate program.**

### **Research Seminar, CH 586**

Near the time of their dissertation/thesis defense (and ideally immediately prior to the scheduled defense), the research seminar provides students the opportunity to present their research accomplishments to the Department community in terms of the historical perspective of the subject as well with the current results. It is expected that in the presentation, the student will demonstrate critical understanding and mastery of the subject matter. The lecture is graded by attending faculty members, and **a grade of “C” or lower requires that an additional seminar be given during the next semester. CH 586 also requires attendance at seminars like CH 585.** In addition, a **written 2-page abstract of the talk must be distributed to faculty on the Friday preceding the presentation date.**

CH 586 will typically occur during the last semester in residence for Ph.D. and Plan I (Thesis) M.S. students. **Students should only register for CH586 ONCE.** If you cannot complete the seminar during the registration semester, a grade of “incomplete” will be given; this will be replaced with a grade when the seminar is completed.

Students should see the Seminar Coordinator (currently Prof. Metzger) for scheduling and to obtain other information about requirement such as abstract preparation and presentation guidelines.

### **8. Research Credit toward a Degree**

Graduate students will normally take  $\geq 12$  semester hours of “Research Techniques” courses over the span of their Ph.D. work. The research techniques courses are graded with a letter grade assigned by the research mentor. *The exact number of hours of these courses required will depend on the sum of other graded coursework taken such that the total number of coursework credits is at least 48 hours.* You may register for 1-6 credit hours of these courses in each semester. The following courses fit into this category:

1<sup>st</sup> Year - CH 570

Research Techniques in Chemistry

2<sup>nd</sup> year & beyond - CH 660

Adv. Research Techniques in Chemistry

**Note:** Normally, the advanced research techniques courses will be taken after the first year and can be used to supplement research technique hr as needed to give the student enough graded coursework hours to meet the degree requirements (see above).

**Once doctoral students have achieved “Candidacy”, they must register for a minimum of 3 credit hours of dissertation research (CH699) in every Fall/Spring.**

During the semester of their dissertation defense, the Graduate School permits students to enroll for only these three credit hours. Students whose dissertations are accepted after the deadline for graduation during the semester may be able to under-enroll in the following semester. Meet with the Graduate Director to discuss these options. Note that the visa requirements for international students generally do not permit under-enrollment.

### **C. The Dissertation Committee**

**After consultation with their research advisor, students will designate a dissertation committee.** This is composed of five faculty members: Research Advisor (chair), three faculty from the Department of Chemistry & Biochemistry, and one from outside of the Department. This last member can be a faculty member from another UA department or an individual from off-campus. In the latter case, the individual should hold a Ph.D. (or equivalent terminal degree) and should have a demonstrated record of research or scholarly activity. These individuals must be appointed to Temporary Membership on the UA Graduate Faculty. This procedure requires a CV from the individual and completion of the request form. If the qualifications of the individual are not evident from the CV, then a short, written explanation is required. This form should then be submitted to the Graduate Program Assistant.

To appoint a committee:

1. Go to <https://graduate.ua.edu/current-students/>;
2. At bottom, click on “Graduate Academic Activities” and login using MyBama credentials.
3. Click on “Thesis/Dissertation Activities” and follow link to “manage” Committee Formation.
4. Click on “Add New Member” and select name from list to invite each faculty member to serve on committee. You will need to designate your advisor as “Committee Chair”, other Chemistry & Biochemistry faculty as “Committee Member”, and the external member as “External Member”.

## D. Meetings with the Committee

**Students will hold annual meetings with their committees in the Spring semester. In each meeting, the student will present an update of their progress through the degree program, and the committee will provide feedback regarding the student's progress. The committee can request that additional work be completed to address any deficiencies in the presentation. All remediation must be completed in the following semester (Summer). Failure to satisfactorily complete this requirement will result in the student being found out of good standing and, thus, ineligible for Departmental support.**

Meetings should be scheduled as early as practical, and the Department should be notified of the planned meeting time, date and room (form on webpage). A minimum of three UA Chemistry committee members must be present for a valid meeting. All four UA Chemistry members are required for the 2<sup>nd</sup> year meeting (IRR, CH680). The entire committee should convene for the Oral Candidacy exam (3<sup>rd</sup> year, CH681) and the dissertation defense. When unavoidable, a committee member may attend these meetings remotely (via Skype or other teleconference technology).

### First-Year Meeting

**All students should briefly (≤30 minutes) meet with their committees in Spring of their first year. In this meeting**, students should present:

- 1) A summary of progress (grades, cumulative exams, etc.)
- 2) A tentative Plan of Study
- 3) Goals for summer research

Items 2 and 3 should be completed with significant input from the research advisor.

### Second-Year Meeting: Initial Research Review (IRR, CH 680)

**All students must present to their committee an initial review of their research efforts, taken as a 1 hr course (IRR, CH680) in Spring of the 2<sup>nd</sup> year.** The purpose of this meeting is for the student to demonstrate knowledge of his/her research project and document initial research progress for the committee. The committee will question the student and provide input about the initial research effort. There are two aspects of this examination that will be considered by the committee:

- 1) **A brief written summary (≤10 pages) by the student of the project and initial research findings to date is to be provided to the committee one week in advance of the meeting.**
- 2) **An oral presentation with a period for discussion and questioning to follow such that the entire meeting is completed within 2 hours. The oral presentation should include:**
  - a. **A summary of progress (grades, cumulative exams, etc.)**
  - b. **A discussion of the background and significance of the research project**
  - c. **A description of the work completed to date**
  - d. **A description of plans for the next year**

Comments from the committee about the student's IRR will become part of the student's academic record, and the committee will assign the student a grade for the CH 680 course based on progress, familiarity with the project, and the quality of the summary, presentation, and subsequent discussion. The grades will be:

PASS: the student has made satisfactory progress to continue in the program. The committee will also determine if the student should continue in the doctoral or M.S. degree program.

FAIL: the student has not made satisfactory progress and should be dismissed from the graduate program.

INCOMPLETE: the presentation was unsatisfactory, but the committee feels that with additional work, a passing grade can be earned. This remediation must be completed by the following semester.

### **Third-Year Meeting: Oral Candidacy Examination (OCE, CH 681)**

After completion of the cumulative exams (see below), **students must complete the "oral" part of the candidacy exam**. This exam will be held as the Third Year Committee Meeting. Students will present a detailed research summary and an original research proposal. Each of these parts will be supported by a written document delivered to every committee member at least one week prior to the exam. In connection with this exam, students must register for CH681 (1 credit hour).

#### Research Presentation:

Students should prepare an oral presentation (supported with computer graphics) of results and prospects to be presented to the dissertation committee during the exam. Slides should

be clear and properly referenced. The research presentation will be composed of:

- a. **A summary of progress (grades, cumulative exams, etc.)**
- b. **A discussion of the background and significance of the research project**
- c. **A description of the work completed to date**
- d. **A description of plans for completing research for a dissertation**

At this point, students should show command of their project's background and goals. The motivation behind the project should be described. Additionally, students should begin to demonstrate the ability to critically evaluate their own results as well as make predictions regarding the outcomes of future work.

The research presentation will be supported by a written report composed of a **minimum of ten double-spaced pages** of text and figures. All information from sources other than the student (including other group members, UA personnel, and external resources) should be properly attributed. A list of consistently formatted references should be appended to the end of the report and will not contribute to the page count.

#### Original Research Proposal:

The remainder of the exam will involve the defense of an original research proposal. The proposal can be related to the student's research but cannot involve an extant part of the advisor's research program. Alternatively, the student can propose a line of inquiry remote from their own projects. In either case, the topic must be endorsed by the advisor as not being a current direction within their group. An abstract must be approved by the committee well in advance of the examination. The student will be evaluated on the identification of a significant research question, the development of hypotheses, and the proposal of specific experiments to test these hypotheses. The scope of the proposal should encompass a minimum of a single specific aim with the recognition of potential problems in the experimental design and potential routes to overcome them.

The proposed project should be described in a properly referenced paper handed out to each committee member at the same time as the research report. The proposal should be a **minimum of five, double-spaced pages**. Appended to this should be a budget appropriate for the scope of the proposed work. This budget should assume that the work will be performed in a standard laboratory at UA and should list costs of personnel, benefits, tuition, equipment not readily available at UA, travel, supplies, and overhead costs. More information on these can be found at the Office of Sponsored Research website. An oral presentation of the

proposal should be prepared and defended by the student at the exam.

The committee will evaluate the presentations and award grades. **A passing grade indicates that the student has passed both parts of the exam and satisfies the requirements for doctoral candidacy.** Where one or both parts of the exam were deficient, an “incomplete” will be given. Additional work will then be required by the student to earn a passing mark. The nature of such work and the procedure to evaluate the results will be determined by the student’s committee. Satisfactory completion of this additional work will change the grade to “pass”. Failure to satisfactorily complete the work in a timely fashion will result in a grade of “fail”. **The receipt of a “fail” grade signifies serious deficiencies that necessitate dismissal from the doctoral program.** The Graduate Committee will determine (with input from the dissertation committee) whether relegation to the Master’s program is appropriate.

#### **Fourth-Year Meeting (and Fifth-Year Meeting, if needed)**

**Annual committee meetings after achieving candidacy will be held in Spring to ensure that students remain on track for the timely completion of their dissertations.** Students will present:

- (1) A research update research progress**
- (2) A rough outline of the dissertation.**

Every student should schedule a meeting with their dissertation committee in their 8th academic semester. The student will prepare and distribute a structured draft of the table of contents for their planned dissertation. Items should be labeled as completed, in progress, or planned. The student will then present an oral research update (with PowerPoint slides) to the committee. An important part of the discussion will involve the additional work that should be completed for the dissertation and the timeline for its completion. Students with dissertation defenses scheduled to allow graduation in the following semester (summer) will be allowed to waive this requirement; the advisor’s signature will be required to confirm these plans.

Students not graduating are required to repeat the ARR annually. At each meeting, the committee will evaluate whether an acceptable dissertation is likely to be produced. This determination will aid in decisions to extend departmental support beyond the 5th year. Again, students with dissertation defenses scheduled to allow graduation by the following term (for most students, the following summer) will be allowed to waive this requirement; the advisor’s signature will be required to confirm these plans.

**Students who do not complete/pass annual committee meetings on time will not be in good standing and will not be eligible for graduate student assistantships in the**



**following fall. In cases where extenuating circumstances (serious illness, for example) hinder the timely completion of a committee meeting, the Graduate Committee can be petitioned for a time extension.**

### **E. Written Candidacy Exam: Cumulative Exams (Cumes)**

Ph.D. candidates must pass four cumulative exams (cumes) within 20 opportunities. Cumes (in each major area of chemistry: biochemistry, inorganic, analytical, organic, and physical chemistry) are given monthly, except in August and December, normally on the 3<sup>rd</sup> Monday of the month at 7-10 PM in Shelby Hall. A cume schedule is posted each August in the main hallway. Students starting in Fall begin taking cumes in September of their first year and thus have until July of their 2<sup>nd</sup> year to pass 4 exams. Students must pass at least two exams in their major area. However, students may take cumes in any area of chemistry and up to two “passes” will be counted in areas outside of the major area. **Students may only turn in one exam paper for grading in any given month (one attempt per session).**

Although many beginning students do not pass cumulative exams, all students are strongly encouraged to take an exam in every session, do their best, and treat them as a learning experience. With time, students master the subject material well enough to pass these exams.

**Cumulative exams constitute the written portion of a doctoral student’s “candidacy” exam. Failure to pass this requirement will result in dismissal from the Ph.D. program.**

### **F. Research and Dissertation**

#### **1. Amount of Research for Dissertation**

As chair of the dissertation committee, the **research advisor will largely determine the amount of work required for the dissertation**; however, the entire dissertation committee is involved in judging both the quality and quantity of research work accomplished as well as its defense by the student.

#### **3. The Final Version of the Dissertation**

A final version of the dissertation will be given to each of the committee members serving on the Dissertation Committee at least two weeks before the oral defense. The student is expected to be responsible for all aspects of the production of the dissertation, including the preparation, word processing, reproduction, dissemination to the committee members, and all costs involved.

#### **4. Oral Defense of Dissertation**

A majority affirmative vote by the Dissertation Committee hearing the oral defense constitutes satisfactory fulfillment of the research and dissertation requirement.

#### **G. Policy Concerning Publications**

**At the time of graduation, the Ph.D. candidate will have at least one publication accepted by a refereed journal, or in lieu thereof, the dissertation will be examined by an external referee designated by the Director of Graduate Studies in consultation with the Graduate Committee.**

## V. Degree Requirements for the M.S. in Chemistry

Two types of Master's degrees can be earned in Chemistry. Plan I (thesis MS) requires more intensive research leading to the composition and defense of a MS thesis. Plan II (coursework) has a stronger emphasis on classroom work.

### A. Requirements for all M.S. Candidates

1. Whether Plan I or Plan II, all M.S. candidates select a faculty advisor by the end of their first semester and are required to do so by the end of the first month of their second semester. In addition, a three-person Examining Committee composed of the Research Supervisor and at least two other Graduate Faculty members should be formed by the end of the student's 2<sup>nd</sup> semester. Plan I thesis MS students are required to have one member from outside of the Department of Chemistry & Biochemistry; Plan II committees can be entirely from the Department. The procedures for appointing committees is described on page 20.
2. M.S. candidates must register for Seminar (CH 585) and conform to the attendance policy each semester they are in residence, unless they are registered for Literature and Communication in Graduate Chemistry (CH 584) or Research Seminar (CH 586).
3. All M.S. candidates must complete a Second-Year meeting with their committees. Students should register for CH 680 (Initial Research Review, IRR). The purpose of this meeting is for the student to demonstrate knowledge of his/her research project and document initial research progress for the committee. The committee will question the student and provide input about the initial research effort. There are two aspects of this examination that will be considered by the committee:
  - **A brief written summary (≤10 pages) by the student of the project and initial research findings to date is to be provided to the committee in advance of the meeting.**
  - **An oral presentation with a period for discussion and questioning to follow such that the entire meeting is completed within 2 hours. The oral presentation should include:**
    - a. **A summary of progress (grades, cumulative exams, etc.)**
    - b. **A discussion of the background and significance of the research project**
    - c. **A description of the work completed to date**
    - d. **A description of plans for the thesis (if applicable)**

Comments from the committee about the student's IRR will become part of the student's academic record, and the committee will assign the student a grade for the CH 680 course based on progress, familiarity with the project, and the quality of the summary, presentation, and subsequent discussion. The grades will be:

PASS: the student has made satisfactory progress to continue in the Master's degree program.

FAIL: the student has not made satisfactory progress and should be dismissed from the graduate program.

INCOMPLETE: the presentation was unsatisfactory, but the committee feels that with additional work, a passing grade can be earned. This remediation must be completed by the following semester.

This meeting will serve as the comprehensive exam for Plan II MS students.

4. A degree application form must be submitted to the Graduate School to be awarded a degree. Note that doctoral students do not have an M.S. degree option. Request that this be added by sending an email to the Graduate Director.
5. All M.S. candidates must complete an exit exam for program assessment purposes. This will typically constitute a standardized exam in the student's major area similar to the placement exams given at the beginning of the program.

## **B. Specific Requirements for Plan I (thesis) M.S. Candidates**

1. The lecture coursework requirement for the Plan I M.S. degree consists of a minimum of four courses — at least two within the student's major and at least one outside the major — for a total of 12 semester hours of credit.
2. Another 12 credit hours will normally consist of 4 hours of seminar (CH 585 3 hr total + CH 586 1 hr), 1 hour for the Initial Research Review (CH 680), and 7 hours of research techniques courses. The candidate will present a research seminar on the thesis research before holding the oral defense of the thesis. As in the case for Ph.D. students, a maximum of six hours of graded (500-level) research techniques courses will be counted in the departmental computation of the GPA.

3. Plan I M.S. candidates will normally register for at least 6 hours of thesis research, *i.e.*, CH 599, in addition to the 24 course credit hours described above.

4. The student's Research Supervisor and the other members of the student's Examining Committee will read the student's thesis and render a decision on the results of its oral defense. This oral defense will count as the MS comprehensive exam for the student (note: form must be filed with Graduate School).

5. The period of financial support for students following the Plan I M.S. program is limited to 2.5 years. In special cases, a Plan I student may petition the graduate committee for an additional semester of support to be granted as deemed warranted by the Graduate Committee and dependent upon the availability of funds.

#### **C. Specific Requirements for Plan II (coursework) M.S. Candidates**

1. The lecture coursework requirement for the Plan II M.S. degree will consist of a minimum of six lecture courses — four in the major and two outside the major — for a total of 18 semester hours of credit.

2. The remaining 12 hours required for this 30-hour program will consist of:

3 credit hours for Literature & Communication in Graduate Chemistry (CH 584)

3 total credit hours of seminar (CH 585)

5 total credit hours of research techniques (CH 570 or 660)

1 hour for the Initial Research Review (CH 680).

3. The period of financial support for those students following the Plan II M.S. degree program is normally limited to 2.0 years.

#### **D. Accelerated Master's Program in Chemistry**

The Accelerated Master's Program (AMP) is intended for highly motivated Chemistry majors whose objectives include degrees at the master's level. Up to 15 credits hours of coursework can be applied simultaneously toward both the B.S. and M.S. degrees. The remainder of the credit hours for each degree are completed independently, though both undergraduate and graduate courses may be taken in the same semesters.

The process to enter the AMP is:

1. ACS Chemistry and ACS Biochemistry majors with a 3.5 gpa and 90 credit hours of coursework are eligible for admission.
2. Interested students contact the Director of Graduate Recruiting to begin the application process. It is suggested that students begin the application late in the sophomore year or early in the junior year.
3. A regular application (including GRE score) is submitted to the Graduate School. The application fee will be waived and the UA transcript will be attached automatically.
4. Approved students will be admitted to Graduate School as M.S. students.

Once admitted the students may pursue either a Plan I or Plan II M.S. by completion of the requirements described in the sections above except that AMP students are required to pass only one credit hour of Chemistry Seminars (CH585). Lecture/lab courses that are co-listed as undergraduate and graduate courses can then potentially count towards both degree programs. Students must register for the graduate level courses and notify the Director of Graduate Studies that they intend to count these courses in both the B.S. and M.S. programs. The rest of the requirements for each degree are met separately.

## **VII. APPENDICES**

## **A. List of Forms**

### **Minimum Safety Regulations Certification Statement**

*(read safety rules, sign form & return to the Chemistry Office)*

### **Selection of Research Advisor**

*(Departmental)*

### **Appointment of Temporary Graduate Faculty Member**

*(Grad. School)*

### **Report of Initial Research Review - CH 680**

*(Departmental)*

### **IRR Assessment forms**

*(Departmental)*

### **Outline of Ph.D. Program - Plan of Study**

*(Grad. School, Departmental template is available)*

### **Approval of Oral Candidacy Proposal Abstract**

*(Departmental)*

### **Report of Oral Candidacy Exam – CH 681**

*(Departmental)*

### **Oral Candidacy Exam Assessment forms**

*(Departmental)*

### **Admission to Candidacy for Doctoral Degree**

*(Grad. School)*

### **Report of Annual Research Review**

*(Departmental)*

### **Dissertation Acceptance Form**

*(Grad. School)*

### **Exit Form**

*(Departmental)*

### **Form Websites:**

<http://chemistry.ua.edu/for-students/>

<http://graduate.ua.edu/academics/forms/index.html>



## **B. Doctoral Degree Landmarks** **(for Fall admission)**

### **Prior to 1<sup>st</sup> Academic Semester**

Orientation:

- (1) Entrance exams
- (2) Advising and Registration for Courses
- (3) International Student Check-in
- (4) ITAP Placement Exam (international students)
- (5) Graduate School TA Workshop
- (6) A&S Legal Training
- (7) Departmental TA Training
- (8) Safety Training
  - a. Read “minimum safety rules”
  - b. Sign and turn in **safety certification form**
  - c. Pass training videos
  - d. Fume hood training

### **1<sup>st</sup> Academic Semester**

Advisor Selection

- a. Faculty research presentations
- b. Interview at least four faculty who sign **advisor selection form**
- c. Rank advisor choices and turn advisor selection form in to Graduate Director by Thanksgiving Break.

### **2<sup>nd</sup> Academic Semester**

- (1) Set up dissertation committee
  - Appointment or Change of Dissertation Committee form (PhD students)**
  - Appointment or Change of Thesis Committee form (Plan I MS students)**
- (2) 1<sup>st</sup> year Committee Meeting
  - a. Notify office of date
  - b. **ARR Report form**

### **3<sup>rd</sup> Academic Semester**

- (1) LitComm (CH 584)
- (2) A&S Legal Training refresh

### **4<sup>th</sup> Academic Semester**

Initial Research Review

- a. Register for CH680
- b. Notify office of date
- c. Distribute report at least one week before meeting.
- d. **IRR Report form**
- e. **Assessment forms** (one for each committee member)

### **2<sup>nd</sup> year Summer**

End of cumulative exam opportunities in July.

### **6<sup>th</sup> Academic Semester**

- (1) Plan of Study

**Plan of Study form (see Director of Graduate Studies)**

- (2) Oral Candidacy Exam (CH681)

- a. Register for CH681
- b. **Committee approval of abstract form**
- c. Notify office of date
- d. Distribute written materials at least 1 week before the exam.
- e. **Oral Candidacy Exam\_Report form**
- f. **Assessment forms** (one for each committee member)

### **8<sup>th</sup> Academic Semester**

Annual Research Review

- a. Notify office of date
- b. Distribute TOC at least one week before meeting.
- c. **ARR Report form**

### **10<sup>th</sup> Academic Semester (if necessary)**

Annual Research Review

- a. Notify office of date
- b. Distribute TOC at least one week before meeting.
- c. **ARR Report form**

## **12<sup>th</sup> Academic Semester (if necessary)**

### Annual Research Review

- a. Notify office of date
- b. Distribute TOC at least one week before meeting.
- c. **ARR Report form**

## **Final Semester**

### (1) Research Seminar

- a. Register for CH 586 (if not done already)
- b. Notify office of date

### (2) Dissertation Defense

- a. **Apply for graduation (MyBama)**
- b. Notify office of date
- c. Distribute dissertation at least two weeks before the defense.
- d. **Dissertation Acceptance form**
- e. **Assessment forms** (one for each committee member)

### (3) **Exit form**

## C. Doctoral Registration Example

### YEAR 1

Fall	hr	type	Spring	hr	type
course 1	3	A/F	course 3	3	A/F
course 2	3	A/F	course 4	3	A/F
CH 585	1	A/F	CH 585	1	A/F
			CH 570	1	A/F
<b>total</b>	<b>7</b>			<b>8</b>	

### YEAR 2

Fall	hr	type	Spring	hr	type
course 5	3	A/F	course 6	3	A/F
CH 584	3	A/F	CH 585	1	A/F
CH 585	1	A/F	CH 660	2	A/F
			CH 680	1	P/F
<b>total</b>	<b>7</b>			<b>7</b>	

### YEAR 3

Fall	hr	type	Spring	hr	type
CH 660	6	A/F	CH 660	5	A/F
CH 585	1	A/F	CH 585	1	A/F
			CH 681	1	P/F
<b>total</b>	<b>7</b>			<b>7</b>	

### YEAR 4

Fall	hr	type	Spring	hr	type
CH 699	6	P/F	CH 699	6	P/F
CH 585	1	A/F	CH 585	1	A/F
<b>total</b>	<b>7</b>			<b>7</b>	

### YEAR 5

Fall	hr	type	Spring	hr	type
CH 699	6	P/F	CH 699	6	P/F
			CH 585	1	A/F
CH 585	1	A/F	CH 586	1	A/F
<b>total</b>	<b>7</b>			<b>8</b>	

## D. Chemistry Graduate Program Faculty

<u>FACULTY</u>		<u>OFFICE</u>	<u>RESEARCH AREA</u>
Jared Allred	<a href="mailto:jmallred@ua.edu">jmallred@ua.edu</a>	Shelby 3036	Materials/Inorganic
Martin Bakker	<a href="mailto:bakker@ua.edu">bakker@ua.edu</a>	Shelby 1030	Physical/Analytical
Silas Blackstock	<a href="mailto:blackstock@ua.edu">blackstock@ua.edu</a>	Shelby 2050	Organic
Marco Bonizzoni	<a href="mailto:mbonizzoni@ua.edu">mbonizzoni@ua.edu</a>	Shelby 2101A	Organic/Analytical
Carolyn Cassady	<a href="mailto:ccassady@ua.edu">ccassady@ua.edu</a>	Shelby 1064	Analytical
David Dixon	<a href="mailto:dadixon@ua.edu">dadixon@ua.edu</a>	Shelby 1007B	Physical
Jack Dunkle	<a href="mailto:jadunkle@ua.edu">jadunkle@ua.edu</a>	Shelby 3097E	Biochemistry
Patrick Frantom	<a href="mailto:pfrantom@ua.edu">pfrantom@ua.edu</a>	Shelby 3097B	Biochemistry
Ayanjeet Ghosh	<a href="mailto:aghosh6@ua.edu">aghosh6@ua.edu</a>	Shelby 1007E	Physical
Arunava Gupta	<a href="mailto:agupta@ua.edu">agupta@ua.edu</a>	Shelby 2101B	Physical/Materials
Michael Jennings	<a href="mailto:jenningsm@ua.edu">jenningsm@ua.edu</a>	Shelby 2076	Organic
Robert Metzger	<a href="mailto:rmetzger@ua.edu">rmetzger@ua.edu</a>	Shelby 1088B	Physical
Shanlin Pan	<a href="mailto:span1@ua.edu">span1@ua.edu</a>	Shelby 1088E	Analytical
Elizabeth Papish	<a href="mailto:etpapish@ua.edu">etpapish@ua.edu</a>	Shelby 3064	Inorganic
Brad Pierce	<a href="mailto:bspierce1@ua.edu">bspierce1@ua.edu</a>	Shelby 3097D	Bioinorganic
Paul Rupar	<a href="mailto:parupar@ua.edu">parupar@ua.edu</a>	Shelby 2101D	Polymers
Kevin Shaughnessy	<a href="mailto:kshaughn@ua.edu">kshaughn@ua.edu</a>	Shelby 2072	Organic/Inorganic
Timothy Snowden	<a href="mailto:snowden@ua.edu">snowden@ua.edu</a>	Shelby 2046	Organic
Shane Street	<a href="mailto:ssstreet@ua.edu">ssstreet@ua.edu</a>	Shelby 1088A	Analytical
Gregory Szulczewski	<a href="mailto:gjs@ua.edu">gjs@ua.edu</a>	Shelby 1088D	Analytical/Physical
Matthew Thompson	<a href="mailto:mthompson10@ua.edu">mthompson10@ua.edu</a>	Shelby 3006E	Biochemistry
John Vincent	<a href="mailto:jvincent@ua.edu">jvincent@ua.edu</a>	Shelby 3040	Inorganic/Biochem
Stephen Woski	<a href="mailto:swoski@ua.edu">swoski@ua.edu</a>	Shelby 3006D	Biochemistry/Organic

## E. Working in the Laboratory

### 1. Emergency Procedures

#### a. General emergency phone numbers:

**911 (from campus phones only)**

**348-5454 University Police (direct number)**

**Do not call 911 from your cell phone: the call will be routed to Tuscaloosa City EMS and will delay the dispatch of assistance. Call the UA police direct number (205-348-5454)**

Report nature and location of the emergency; give your name, telephone number, building and floor number. Tell the operator where you will meet the emergency vehicle. If an individual is involved, report whether he/she is unconscious, burned, trapped, etc.; whether an explosion has occurred, whether smoke or poison gas may be present; or whether there has been a chemical or electrical fire.

#### b. In Case of Personal Injury...

- i. Take all steps necessary to prevent further injury. Apply first aid if trained and call UA police at 348-5454, if necessary.
- ii. If the victim(s) is (are) found unconscious for no apparent reason, **DO NOT ENTER THE ROOM** – a poison gas may be present. Obtain assistance immediately (call police 348-5454) and notify other persons in the area. **NO ONE SHOULD ENTER UNLESS EQUIPPED AND TRAINED IN THE USE OF PROPER EMERGENCY EQUIPMENT.**
- iii. Check if the victim is in contact with an electrical circuit; if so, **DO NOT TOUCH HIM/HER WITHOUT DISCONNECTING THE POWER FIRST**, then apply first aid. Call UA police (348-5454) to arrange for medical assistance.

#### c. While Waiting for Assistance, Do What Is Necessary to Protect Life!

- i. Do not move an injured person unless he/she is in further danger. Keep him/her warm.
- ii. If his/her clothing is on fire, wrap him/her in a coat, blanket or whatever is available to extinguish the fire (Remember: **Stop, Drop, & Roll**). Remove any clothing contaminated with chemicals. Douse with water to remove heat and place clean, wet, ice-packed cloths on burned areas, and keep warm. Get medical attention immediately.
- iii. If injured person is not breathing, provide artificial respiration if you are trained. Mouth-to-mouth method should not be used in cases of gas poisoning.
- iv. If the victim is bleeding severely, control the bleeding by compressing the wound with a cloth, and elevate the injury above the level of the heart.

v. If chemicals have been spilled on a person, get him/her under a shower or spigot to wash thoroughly the affected area. If the person has chemicals in his/her eyes, irrigate with water for 15 minutes. Check for and remove any contact lenses.

**d. In Case of Fire or Explosion...**

i. Evacuate the immediate area.

ii. Attempt to extinguish flames only if you have received the required UA safety training in the use of portable fire extinguishers. Many fires may be extinguished with dry-chemical ABC extinguishers.

**P Pull the pin**

**A Aim at the base of the fire**

**S Squeeze the trigger**

**S Sweep**

For fires involving metals or metal hydrides, use sand to smother the flames.

iii. If the fire is not completely out after discharging one extinguisher, close the door of the laboratory, call the UA Police (348-5454) and warn other people in the building by sounding the fire alarm. If you decide to continue fighting the fire, **OBSERVE EXTREME CAUTION**. Consider that hot spots can re-ignite, the air in the immediate area may be hot enough to cause lung damage, oxygen in the air may be used up, fire can travel through walls and break out behind or beside you, gas cylinders may explode in the intense heat, smoke and poisonous fumes can kill, and solvent cans or bottles could burst creating an inferno. Do not try to be a hero.

iv. When fire alarm sounds, all persons should shut off gas, water, and appropriate electric-powered equipment, close doors and windows, and immediately exit the building by the nearest unobstructed stairs. **DO NOT USE THE ELEVATOR. DO NOT STOP TO RETRIEVE PERSONAL BELONGINGS. Take your keys and wallet with you (as well as a coat) in case you cannot re-enter the building. Shelby Hall administrative personnel can be found in the North parking lot.**

v. Remain outside the building until permission to re-enter has been given by security personnel.

## **2. Laboratory Safety**

Safety is Your Personal Responsibility. You are working with materials that may be extremely hazardous to the safety of yourself and your fellow-workers. Think safety - work safely. You, the Department and the University have legal responsibilities to do your work safely in a safe environment. Safety is not only the safety of you and all others in the areas in which you work but also for the environment. You must successfully complete all UA required safety courses.

- Know the characteristics of each of the chemicals you will use – their toxicity, flammability, reactivity, and environmental impact.
- Know the safety limits of the chemicals you will use – their flash point, their auto-ignition temperature, etc., and what to do if you exceed these limits.
- Check your equipment before you start.
- Be sure that you have installed the necessary mechanical safety devices, shields, hoods, etc., before you start and that they are more than ample to handle any contingency.
- Make sure that electrical connections are made properly.
- Protect your eyes, your face, your hands, and your body. Always wear appropriate eye protection, proper gloves and proper protective clothing. Over-protect yourself rather than under-protect yourself. Closed toe shoes are required in the laboratory. Garments with low-flammability are required especially when working with flames or flammable reagents.
- Contact lenses do not serve as protection against eye injury and do not substitute for safety glass and chemical splash goggles. Many organizations, including the National Institute for Occupational Safety and Health (NIOSH) and the American Chemical Society have removed most restrictions on wearing contact lenses in the laboratory. However, some lens materials are hazardous when worn in the presence of certain chemicals. Before an individual chooses to wear contact lenses in the laboratory, they and their laboratory supervisor must consult SDS for information regarding contact lenses and specific chemicals present. If contact lenses are deemed safe to be worn in the lab, chemical splash goggles must be worn as primary eye protection.
- All your senses are needed to be aware of your surroundings! Earbuds will allow you to listen to music without disturbing your coworkers, but you should still be able to hear what is happening in the lab.
- Practice good housekeeping. Keep your work area clean and free from extraneous articles. Wipe up spills immediately. Dispose of waste (chemical, biohazard, and broken glass) in proper closed receptacles. No food or drink in the laboratory.



- Know the location of eye baths, safety showers, and fire extinguishers, how to get to them quickly, and how to use them. There is no smoking on campus.
- Make safety a habit. THINK SAFETY... The safe habit is always a good one...on the job, at home, everywhere!

### 3. Minimum Safety Regulations for Research Laboratories

To create safer laboratories and to meet federal and state safety regulations, the safety rules and procedures, as outlined in the booklet, Chemical Laboratory Safety Manual, have been adopted by the Department of Chemistry & Biochemistry. These rules are not attempting to restrict or hamper research. Instead, they are based on common sense and enacted for the benefit and safety of everyone. **Your cooperation is required.** Please bring your laboratories and your laboratory procedures into conformity with these principles. Please remind others to do so. These regulations are mandated by OSHA and the EPA.

The departmental Safety Committee and/or UA Environmental Health and Safety (EHS) personnel will make unannounced inspections of laboratories. All hazards will be recorded, and anyone working in that laboratory will be given a list of deficiencies and instructions on their improvement. The deficiencies will be reported to the faculty research advisor responsible for that laboratory as well as to the Department Chair. Furthermore, the laboratory will be re-inspected to see that the listed deficiencies have been corrected. A comprehensive listing of all deficiencies found will be compiled so that (a) these problems can be discussed at department-wide safety meetings and (b) so that serious problems or frequently encountered problems may be brought to everyone's attention for immediate resolution.

Each of you can make an important contribution by taking this list and systematically checking and correcting unsafe conditions in your laboratory. Please conduct your laboratory operations in accord with these regulations. Most importantly, please develop a positive attitude about this safety effort. It is each of you who stand to benefit most from these efforts. Later in your career, each of you will probably be responsible for the safety of others working with you. Thus, most of the following regulations are nothing more than procedures which will be with you as long as you are in chemistry. A digest of some of the more common rules and procedures is given in the following pages. For a more complete and authoritative coverage of each of these areas, please consult the Chemical Laboratory Safety Manual.

**a. Safety Equipment and Familiarity**

- i. Each student must make know where the fire extinguisher is located in their laboratory. They must know the location of and how to use fire extinguishers and fire buckets with sand. They must successfully complete the annual UA fire safety course.
- ii. Each student must be aware of the location of and know how to use eyewash fountains, showers, fire-blankets, and emergency kits.

**b. Do not smoke in the laboratories or anywhere else on campus**

The University of Alabama is a smoke-free campus: smoking and electronic cigarettes are not allowed.

**c. Eye Safety**

- i. Eye protection must always be worn in the laboratory (i.e. safety glasses, goggles, or shields). Per departmental policy, goggles are required in all teaching laboratories. The type of eye protection required in research labs is determined by the faculty supervisor.
- ii. If you don't normally wear glasses, consider purchasing a nonprescription, fitted pair.
- iii. Contact lenses do not serve as protection against eye injury and do not substitute for safety glass and chemical splash goggles. Many organizations, including the National Institute for Occupational Safety and Health (NIOSH) and the American Chemical Society have removed most restrictions on wearing contact lenses in the laboratory. However, some lens materials are hazardous when worn in the presence of certain chemicals. Before an individual chooses to wear contact lenses in the laboratory, they and their laboratory supervisor must consult SDSs for information regarding contact lenses and specific chemicals present. If contact lenses are deemed safe to be worn in the lab, chemical splash goggles must be worn as primary eye protection.

**d. Storage of Solvents**

- i. All solvents must be stored in appropriate containers.
- ii. Solvent bottles or cans should not be left or kept on bench tops or left in hallways.
- iii. Solvents must not be stored on shelves above benches (serious fire spreading hazard).
- iv. Solvents should be stored in steel solvent storage cabinets.
- v. If it is impossible to store solvents in steel solvent storage cabinets, they must be stored in cabinets behind closed doors. In this way, they will not be accidentally broken when something else happens in the lab.

- vi. Do not store large quantities of solvents in the lab.
- vii. Transportation of chemicals by elevator must be minimized.
- viii. Transportation of chemicals should be performed in rubber safety buckets or another appropriate secondary container. Only a single bottle of a dangerous chemical should be carried at a time.

**e. Storage of Chemicals**

- i. Avoid storing chemicals (especially water reactive substances) near sinks.
- ii. Do not store flammable chemicals above bench tops.
- iii. Do not store any chemicals above eye level.
- iv. All chemicals must be clearly labeled with the full written name of the contents (not a chemical formula) and a device such as the NFPA diamond to indicate hazards. Note: very small amounts of chemicals such as research samples can be labeled with a code that can be used to find the identity of a chemical in your research notebook.
- v. Old chemicals or excess chemicals must be periodically collected and either discarded, placed in the central storage location of your faculty advisor, or taken to the stockroom.
- vi. Chemicals stored in desiccators under vacuum must be kept in closed cabinets, behind shields, or in cages. Never store such desiccators on shelves above bench tops or on lab benches. Label desiccators which are under vacuum.
- vii. All gas cylinders must be clamped, and they should be located in areas reserved for gas tanks.
- viii. Refrigerators:
  - Refrigerators must be regularly defrosted.
  - Chemicals must be clearly labeled.
  - Chemicals should be stored neatly and carefully – not simply "piled in."
  - Do not store food or drinks in refrigerators containing chemicals.

**f. Operations under Vacuum**

- i. Vacuum equipment should be shielded (even glass rotary evaporation units.)
- ii. Vacuum pumps must have belt guards. If not, the pumps must be housed in boxes or housings which serve the same purpose.
- iii. Never evacuate flat bottom flasks, bottles etc.
- iv. All Dewar flasks and desiccators must be carefully taped.
- v. Vacuum pump exhausts should have a filter. If not, the pump outlet should be exhausted into a hood.

**g. “Waste” disposal**

- i. Disposal of unwanted chemicals (waste) must follow EHS (Environmental Health and Safety) rules. Containers for unwanted chemicals must be labeled and kept closed. Do not mix incompatible chemicals in unwanted chemical containers. If any questions arise, please contact your advisor, a member of the safety committee, or EHS (348-5905).
- ii. Requests to EHS for pick-up of unwanted chemicals must be made electronically.
- iii. Never dispose of waste alumina or silica gel (i.e., from column chromatography) by dumping into waste cans. Instead, thoroughly soak with water before discarding.
- iv. Never dispose of rags or paper towels which are wet with solvents into the trash cans. Instead, thoroughly soak them with water prior to discarding them.
- v. Broken glassware and other sharps should be not be thrown into trash cans (this endangers the housekeeping staff). Sharps should be stored in closed containers and labeled. Housekeeping will not handle sharps containers; therefore, lab personnel are responsible for removing full containers to the dumpster.

**h. Safety with electricity**

- i. Periodically check the electrical cords on variacs, heating mantles, motors, etc. for damage. Have them repaired when not in excellent shape.
- ii. No power cords should be warm to the touch.
- iii. Electrical cords should not be strung across aisles or along the floor without being properly protected.
- iv. Have all electrical cords carefully placed out of the way of jacks, hot plates, solvents, etc. when in use.
- v. Electrical plugs should be three-pronged (grounded).
- vi. Avoid overloading a circuit by plugging too many devices into a single outlet.
- vii. Know where the fuses are for each lab.
- viii. High voltage circuits (over 600 volts) should be labeled.
- ix. Do not touch any person who has received an electrical shock and appears to still be in contact with the electrical source without disconnecting the electricity. Call campus police (348-5454) for assistance.

**i. General Laboratory Operations**

- i. Specialized training is necessary before performing experiments that pose special risks. Some training will be performed by your research advisor. Other areas (such as radiation, laser safety, biosafety, bloodborne pathogens, animal care, human research, etc.) will require documented training by EHS. **Your advisor will inform you what additional training is required.**

- ii.** Each laboratory has an inventory of all chemicals stored online (CISPro). Contact your research advisor for details on access to the inventory in your laboratory.
- iii.** SDSs (Safety Data Sheets) are available for all chemicals in your laboratory via the ChemWatch database:  
<http://jr.chemwatch.net/chemwatch.web/dashboard>.
- iv.** All reactions must be labeled. This includes operations under vacuum. (Write on a card exactly what your reaction is). Tape the card to the reaction vessel or nearby. Then if an accident occurs when you are not in the laboratory, others will be able to deal with it. If the power goes off, others will be able to anticipate problems, etc.
- v.** Solvent stills should be labeled.
- vi.** All reactions should be shielded when not attended. (Have your research advisor provide lab shields if you don't have enough shielding).
- vii.** All permanent solvent stills should be carefully shielded (your faculty advisor should arrange for the necessary shielding).
- viii.** Cylinders should be moved only with the aid of cylinder carts. Pressure regulating gauges should be removed, and cylinder caps should be on. Return cylinders to stockroom while a positive pressure still exists in the cylinder.
- ix.** Dewars in use should be clamped. When not in use, store in closed cabinets, not on benchtops.
- x.** Water hoses on condensers must be clamped on or wired. Flooding has serious consequences for other labs as well as your own.
- xi.** Water hoses draining to sinks must be securely anchored in place.
- xii.** Solvents should not be exposed to air for long periods (for example, during chromatography operations).
- xiii.** Appropriate personal protective equipment (PPE: glasses, goggles, face shields, gloves, aprons, lab coats, etc.,) must be worn at all times.
- xiv.** Open-toed shoes are not permitted in the laboratories.
- xv.** Do not eat in the lab. Food is allowed in areas such as offices and break rooms where research chemicals are not present.
- xvi.** Bench tops, hoods, passageways, and floors should be kept neat. The single largest cause of accidents is a cluttered and messy work area.
- xvii.** Emergency phone numbers are affixed outside the doors of the laboratory. Emergency telephones can be found on each floor; you should know the location of the telephone nearest to your laboratory.
- xviii.** After fire extinguishers are discharged, contact Environmental Health & Safety (348-5905) to have them replaced.

**xix.** Because of the possible presence of reproductive toxins, persons who are pregnant are encouraged to inform their supervisor and/or EHS who will provide additional personal protective equipment if necessary.

**xx.** Gloves, lab coats and other PPE should not be worn outside of the lab. If you need to wear PPE to transport hazardous chemicals outside of the lab, use unsoiled or new PPE.