

# ***GRADUATE STUDENT HANDBOOK***

**Department of Chemistry  
The University of Alabama**

**Revised August 2017**

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## PREFACE

### TO THE ENTERING STUDENT:

This Handbook will acquaint you with the regulations, requirements, and procedures of our graduate program in Chemistry and facilitate your smooth progression through the various stages of degree work. The Handbook covers information concerning academics, degree requirements and teaching assistantship duties. 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 and 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 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 for all program requirements, the proper forms are obtained, completed, and submitted in a timely fashion.

## LETTER FROM THE CHAIR

Dear New Chemistry Graduate Students:

On behalf of the faculty and staff of the Department of Chemistry, I am pleased to welcome you to The University of Alabama and to the Department of Chemistry. 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 and to return the attached form, signed, to indicate that you are familiar with the procedures. It is especially important that you understand the safety rules and procedures and follow them.

If you are to be paid by the University as a teaching assistant, research assistant, or fellowship holder, please see Ms. Reda Arnold in Room 2008 Shelby. She has the federal and state tax withholding forms and the Employment Eligibility Verification I-9 form, which you must complete and sign. She will also make certain that you are placed on the University payroll, which will enable you to get your UA Action Card.

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 Chemistry Department's address is:

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

The overnight or express mail address is:

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

Prof. Stephen Woski is the Director of Graduate Studies for the Chemistry Department and is located in Shelby 3006D, email: [swoski@ua.edu](mailto:swoski@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 Coordinator, 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 me or Prof. Woski about any other questions that you may have. The Chair's secretary, Ms. April McIntosh, is located in Shelby 2006, phone: 205-348-8436, email: [amcintos@ua.edu](mailto:amcintos@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 Chemistry Department are growing in size 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. Kevin Shaughnessy  
Professor and Chair, Chemistry

## 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. These appointments are 0.5 FTE (full-time equivalents) commitments, and as such should require roughly 20 hours per week of your time. **It is expected that the remaining time (20 hr or more per week) be devoted to academic work including courses, seminars, and research.**

The Graduate School requires that any student past their first 12 credit hours of coursework must maintain a gpa of  $\geq 3.0$  in order to hold an assistantship.

### B. Holding Jobs Outside of the Department

The Chemistry Department regards its teaching and research assistantship stipends as an aid to the graduate student's education as well as payment for specific services rendered. In order for you to make satisfactory progress toward your degree, you must devote all of your remaining time to your coursework, research, and other degree requirements. Therefore, teaching and research assistants are not allowed to hold outside jobs or *to receive other remuneration for services rendered* without expressed permission from the Departmental Chair. This includes the operation of independent enterprises such as online businesses.

An exception to this policy exists for the paid tutoring of UA students. We feel that tutoring aids graduate students in learning chemical subject matter more thoroughly. Therefore, tutoring is encouraged, but the time spent on it should be limited to a maximum of five hours per week. The Department will compile a list of students who are interested in tutoring, but we will not endorse or recommend specific tutors to students. Details such as hours and fees are left to the individuals to negotiate. 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.

### C. Vacation Time and Holidays

Graduate students are normally allowed one week of paid vacation per year. The vacation period should not occur when classes are in session, and the vacation time must be approved by the student's research supervisor. Summer TAs must consult with the Director of Undergraduate Studies, Dr. Michael Jennings, to find out their summer TA duties before scheduling vacation time during the summer terms. A student may

forego one week vacation time in one year to bank the week for a subsequent year as long as it is cleared with the research supervisor.

Graduate students may take staff holidays at Christmas and Thanksgiving. Otherwise, students are expected to be working full time in the program, including during Spring break and between semesters. Times when classes are not in session are prime periods for research and for working on other degree requirements.

#### **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 in order to qualify for future TA support. This requires taking the ITAP course 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 Chemistry has no knowledge of these proceedings beyond access to a student's status as "passing" check or not.

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. At future times (currently every two years) refresher training will be required by the College.

## **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. 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.

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

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 insure that all the required reagents, equipment and supplies are available and in sufficient quantity. If the preceding section did not leave the laboratory and balance room in the proper condition, this condition should be reported to the laboratory coordinator or faculty member in charge of the laboratories. Specific details should be provided in writing.

The class roll should be checked at the beginning of the period, and no student should be permitted to leave the laboratory until his/her work has been completed (including cleanup) to the satisfaction of the TA. It is required that the TA initial each student's data sheet or laboratory report when the experimental work is completed to insure that each student has done the assigned work.

During the early part of the laboratory period, the teaching assistant should determine that each student has the necessary equipment and check each student's equipment carefully to see 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. 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.**

General 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, and each student must sign and return to the TA a statement that they have read and understood the safety rules and procedures, and agree to abide by them. 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. Under no circumstances should the TA be sitting in a chair, standing in the hall having a conversation, and/or grading lab reports or quizzes while the laboratory section is in session.

At the end of the laboratory period, the TA should inspect the laboratory and balance room to determine that each student has left the work area clean, and that the students who were assigned hood and balance room duty for the day have left these areas clean and tidy. Students who fail to leave their desk, sinks, and work areas clean will be penalized by having their grades lowered.

The TA is paid to work twenty (20) hours per week per unit. Typically, three hours (3) are spent for each general chemistry laboratory assignment (5 hrs for each organic lab assignment). About three (3) hours should be spent grading lab reports each week. 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 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. He/she should inform the professor or supervisor in charge if he/she must miss a

staff meeting or a laboratory meeting, and this should be done as far in advance as possible. He/she should report unavoidable absences in writing and discuss anything that is pertinent to the situation. 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.

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.

The teaching assistant is expected to display the utmost integrity and professionalism in dealing with the students. It is against University and Departmental policy for a TA to tutor for a fee any students enrolled in a course in which the TA is assigned. The TA should not fraternize with his/her students, either during the laboratory hours or after hours.

### **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 made a grade of “P” are not considered in making evaluations of academic standing and a maximum of 6 semester hours of either Research Techniques or Advanced Research Techniques courses can be used in the departmental GPA determination. Graduate students will be permitted a maximum of 3 grades of less than “B.” Failure to pass any course (“D” or “F” grade) regardless of grade point average will result in a review of the student’s performance by the Graduate Committee to determine whether the student will be allowed to continue in the graduate program. This review 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 required of all entering graduate students. 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. These exams are used to evaluate the undergraduate preparation of each student and to place him/her in the appropriate level of graduate coursework.

#### **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 considered to be a 0.5 FTE (full time equivalent) appointment by the graduate school. 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 all periods in which they receive financial assistance from the University. Full-time in the context of this policy includes the combinations of study and employment outlined below:

<u>Award/Employment</u>	<u>Minimum hrs required</u>	<u>Maximum hrs recommended</u>
0.25 FTE (10 hours)	9 semester hours	12 semester hours
0.50 FTE (20 hours)	6 semester hours	9 semester hours

The above guidelines apply to graduate students who receive assistantships or similar University stipends for the primary purpose of pursuing graduate study. A fellowship, as a non-service award, is outside the scope of these policies. Fellows, by the terms of their appointments, are required to undertake full-time graduate study (12 hrs 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 the minimum of 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**

Enrollment is not required in the summer to maintain full-time status and health insurance coverage for existing graduate students in good standing in the program. Graduate students may register for 0 – 12 hours in the summer. Students should consult with their faculty advisor to determine whether or not to register.

## **3. Exceptions**

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

## **D. Selection of a Research Project**

1. Faculty members will present their current research during the early part of the fall semester. All new students are required to attend these presentations. In order to receive credit for attendance, students will register for 1 hour of Research Techniques (CH 570). The grade will be assigned on an attendance basis as follows:

0-1 absence = A, 2-3 absences = B, >3 absences = C, D, or F

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. The student will choose a major area of study in chemistry and will list their top three choices for advisor. Placement will occur after all of the 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.

#### **E. Policy of Financial Support**

Department admission letters delineate the precise nature and extent of financial support being offered to graduate students. 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) in subsequent years of study 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 are expected to remain in good academic and programmatic standing in order to qualify for support. Good standing means maintaining a graduate GPA  $\geq 3.0$  and meeting the program requirements on time. A lack of good standing or unsatisfactory teaching or research performance can result in reduction or termination of student financial support.

#### **F. Teaching Experience**

As part of graduate training, graduate students are normally expected to serve as Teaching Assistants (in an assignment that meets with students) for a period of not less than one semester during their graduate studies.

## 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 from pass/fail courses. The remaining credit hours must be taken for a letter grade, and a GPA  $\geq 3.0$  must be maintained overall. (Note: departmental GPA is calculated with a maximum of six hours of graded (500-level) research techniques courses.) 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 Courses (departmental requirement)

Ph.D. students are required to take six (6) lecture courses: **four** formal lecture graduate courses in their major field and **two** formal lecture graduate courses in one or two 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 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 with the exception of CH 501, which may be used by all except inorganic majors.

## 2. Schedule for Completing Required Courses

All doctoral students are expected to take at least two formal lecture graduate courses each semester during their first year. The remaining credit hours will be seminar and research techniques courses. In normal cases, all formal lecture graduate course requirements should be completed by the end of a student's 3<sup>rd</sup> or 4<sup>th</sup> semester in the program.

**NOTE:** 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.

## 3. 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 2005)

\* required course in the major area, † course can count in more than one area

#### Analytical courses:

CH 524	Spectroscopic Methods of Analysis
CH 525	Chromatography
CH 526	Chemometrics
CH 621	Current Trends in Analytical Chemistry
CH 625	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	Advanced Biophysical Chemistry †
CH 566	Advanced Bioorganic Chemistry †
CH 605	Advanced Bioinorganic Chemistry †
BSC 539	Biochemistry/Molecular Biology
BSC 535	Immunology

Inorganic courses:

CH 501	Introduction to Graduate Inorganic Chemistry ( <i>does not count for inorganic majors</i> )
CH 601	Structural Methods *
CH 602	Coordination Chemistry
CH 603	Chemistry of the Solid State
CH 604	Main Group Element Chemistry
CH 605	Advanced Bioinorganic Chemistry †
CH 605	Special Topics in Inorganic Chemistry
CH 606	X-ray Crystallography †
CH 609	Organometallic Chemistry †

Organic courses:

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	Advanced Physical Chemistry I: Kinetics and Statistical Thermodynamics *
CH 549	Advanced Physical Chemistry II: Atomic and Molecular Structure *
CH 625	Electrochemistry †
CH 626	Surface Analytical Techniques †
CH 645	Special Topics in Physical Chemistry
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.

#### 4. 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 must be approved by the Graduate Committee using the process described above.

## 5. Exemptions from Formal Coursework

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.

**NOTE: The departmental Plan of Study template must be modified for submission to the Graduate School. See the Director of Graduate Studies for instructions.**

## 6. 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.

Every semester, student will take one of following seminar courses: CH585 Chemistry Seminars, CH584 "LitComm", or CH586 Research Seminar.

### Chemistry Seminars, CH 585

Each Fall and Spring semester when not taking for CH 584 or CH 586, graduate students must register for Chemistry Seminars (CH 585, currently 2 hr p/f, soon to be 1 hr letter graded). Attendance (12 or 75% of total graduate student research seminars and departmental seminars per semester) is a requirement for a passing grade in CH 585.

### 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 passing grade in this course (A or B) 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 doctoral degree and trigger dismissal from the doctoral 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 similar to CH 585.

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, topic approval, and to obtain other information about meeting the topic seminar requirement (such as abstract preparation and presentation guidelines).

## 7. 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 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.*

The research techniques courses are graded with a letter grade assigned by the research mentor. The following courses fit into this category:

1 <sup>st</sup> Year - CH 570	Research Techniques in Chemistry (1-6 hours credit each term)
2 <sup>nd</sup> year & beyond - CH 660	Adv. Research Techniques in Chemistry (1-6 hours credit each term)

**Note:** Normally, the advanced research techniques courses will be taken after the first year and can be used to supplement research technique hrs 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 semester.**

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 underenroll 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. Initial Research Review (IRR, CH 680)**

Ph.D. students must present to their dissertation committee (see committee description below) an initial review of their research effort (IRR, CH680), taken as a 1 hr course in their 4<sup>th</sup> academic semester. 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 learn about the student’s research project and will question the student and provide helpful input about the initial research effort. Students should consult their Ph.D. advisor and doctoral committee to determine the preferred format of this IRR meeting. However, there are two aspects of this examination that will be considered by the committee:

- 1) A brief written summary by the student of the project and initial research findings to date is to be provided to the committee 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.**

Comments from the committee about the student’s IRR will become part of the student’s academic record, and the committee will give 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. If the committee feels that a student’s presentation or research progress has been unsatisfactory (e.g. grade < B), then the student may be requested to repeat the IRR in order to demonstrate a better grasp of the project and/or more significant progress.

#### **D. Written Candidacy Exams: Cumulative Exams (Cumes)**

Ph.D. candidates must pass four cumulative exams (cumes) within 20 opportunities (whether or not an exam paper is turned in for grading). 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 normally 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.

Although many beginning students do not pass cumulative exams, all students are strongly encouraged to take these exams, do their best, and treat them as a learning experience. With time, students eventually 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.**

#### **E. Oral Candidacy Examination (OCE, formally ORP, CH 681)**

After completion of the cumulative exams and before the end of their 6<sup>th</sup> semester, students must complete the “oral” part of the candidacy exam. Students will meet with their dissertation committee to present a 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).

The research presentation will be composed of a summary of current results and a prospectus for future work leading to completion of a dissertation. At this point, students should show command of their project’s background and goals. The motivation behind the project should be described. Significant delineation of the work that will constitute the future dissertation should occur. Finally, 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. Finally, students should prepare an oral presentation (supported with computer graphics) of results and prospects to be delivered to the dissertation committee during the exam. Slides should be clear and properly referenced.

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 (A or B) indicates that the student has passed both parts of the exam and satisfies the requirements for doctoral "candidate" status. 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 (A or B). The nature of such work, the procedure to evaluate the results, and a timeline for completion 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. In this case, the Graduate Committee will determine (with input from the dissertation committee) whether relegation to the Master’s program is appropriate.

#### **F. Annual Research Review(s)**

Following completion of the oral candidacy exam (6th semester), all students are required to meet with their dissertation committees annually. The purpose of these “Annual Research Reviews” (ARR) is to (1) update the committee on the student’s research progress and (2) ensure that students remain on track for the timely completion of their dissertations.

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/fall/spring) 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 (in the 10th, 12th, etc., academic semesters). 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.

**Failure to complete the ARR in the designated semesters will result in a grade of “incomplete” in dissertation research (CH699) for that term.**

## G. Research and Dissertation

### 1. The Dissertation Committee

By the end of the 3<sup>rd</sup> semester, the student, in consultation with his/her research advisor, will form a dissertation committee, composed of his/her research advisor as chair, at least one faculty member in his/her major area, and three additional graduate faculty members, one of whom must be from outside the Chemistry Department.

The Dissertation Committee will meet with the student on the following schedule:

(a) By the end of the student's 3<sup>th</sup> semester for an initial research review (IRR, *vide supra*) in which the student will describe his/her research project to the committee and tell what has been accomplished to date on the project.

(b) No later than the end of the 5<sup>th</sup> semester (1<sup>st</sup> semester of 3<sup>rd</sup> year) for oral examination of student's original research proposal (ORP, *vide supra*).

(c) A few months prior to the time the student begins to write the dissertation for a final research review (FRR). At this meeting, the student will outline his/her research results and indicate to the committee what his/her dissertation will contain, what research work remains to be completed, *etc.* (This meeting is optional but is highly recommended and may be required by the research mentor or requested by the student.)

(d) After completion of the dissertation, the committee will meet with the student to hear the oral defense of the dissertation. Ideally, this meeting will be held immediately following the student's presentation of his research seminar to the department. However, it may on some occasions be necessary to schedule a dissertation defense meeting separate from the research seminar presentation or to hold a special research seminar outside the normal seminar time. A final version of the dissertation should be provided to the committee two weeks prior to the final defense.

**Note:** After each of the above meetings, the committee chairman (Research Advisor) will make written recommendations to the student and present copies of these to the Director of Graduate Studies for placement in the student's file.

### 2. Amount of Research for Dissertation

Normally, the research will 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 5 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. No departmental supplies, equipment, secretarial time, or other departmental resources may be utilized by the student for this purpose.

### **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.

## **H. Policy Concerning Publications**

At the time of the oral examination, the Ph.D. candidate will have at least one publication accepted by a refereed journal, or in lieu thereof, the dissertation will have been examined by an external referee designated by the Director of Graduate Studies.

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

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

1. All M.S. candidates, *i.e.*, those following Plan I or Plan II, are encouraged to select a Research Supervisor 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, one of which must come from outside the Department of Chemistry, should be formed by the end of the student's 3<sup>rd</sup> semester.
2. All M.S. candidates must complete an Initial Research Review (CH 680).
3. 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).
4. A degree application form must be submitted to the Graduate School in order to be awarded a degree.
5. All M.S. candidates must complete an 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. The remaining 12 hours for the 24-hour thesis M.S. program will normally consist of 5 hours of seminar (CH 585 3 hr total + CH 586 2 hr), 1 hour for the Initial Research Review (CH 680), and 6 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.

4. 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.
5. 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).
6. 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 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 570/660)
  - 1 hour for the Initial Research Review (CH 680).

Only six hours of the graded (500-level) research techniques courses will be counted in the departmental computation of the GPA.

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

## **VII. APPENDICES**

## **A. List of Forms**

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

*(enclosed in your orientation packet – read safety rules, sign form & return to the Chemistry Office)*

### **Selection of Research Advisor**

*(Departmental)*

### **Appointment or Change of Doctoral Dissertation Committee**

*(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**

### **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. Research Techniques CH570-025  
(faculty research presentations & professional development)
- 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.

### **3<sup>rd</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) Lit Comm (CH 584)
- (3) 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	hrs	type	Spring	hrs	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	AF
<b>CH 570-025</b>	1	A/F	CH 570	5	A/F
<b>total</b>	<b>8</b>			<b>12</b>	

### Summers:

Generally, you will not register during the Summer. If you are TA, you are welcome to register; if you are on RA, you must ask your advisor for permission to register. Fellowship students do not register for summers. If you do intend to register, you will need to inform the Director of Graduate Studies to ensure that your tuition is paid. You will also be responsible for course fees.

### YEAR 2

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

### YEAR 3

Fall	hrs	type	Spring	hrs	type
CH 660	5	A/F	CH 660	4	A/F
CH 585	1	A/F	CH 585	1	A/F
			CH 681	1	A/F
<b>total</b>	<b>6</b>			<b>6</b>	

**YEAR 4**

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

**YEAR 5**

<b>Fall</b>	hrs	type	<b>Spring</b>	hrs	type
CH 699	6	P/F	CH 699	6	P/F
CH 585	1	A/F	CH 586	2	A/F
<b>total</b>	<b>7</b>		<b>8</b>		

**This schedule assumes that you will defend your dissertation before the deadline in the 2<sup>nd</sup> semester of the fifth year. If you will graduate earlier than this, you will need extra hours of CH 699 to reach a total of  $\geq 24$  credit hours by your final semester.**

**In the semester you complete your dissertation (including summers), you must take at least 3 hr of CH 699 and should take CH 586 (if you have not already done so).**

**If you do not meet the deadline to graduate in a given semester, there are grace period deadlines that you can meet to reduce the registration required in your final semester to zero or one credit hour. See the Director of Graduate Studies for details.**

## D. Chemistry 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
Anthony Arduengo III	<a href="mailto:aj@ajarduengo.net">aj@ajarduengo.net</a>	Shelby 3068	Organic/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
Michael Bowman	<a href="mailto:mkbowman@ua.edu">mkbowman@ua.edu</a>	Shelby 1007A	Physical/Biochem
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
Arunava Gupta	<a href="mailto:agupta@ua.edu">agupta@ua.edu</a>	Shelby 2101B	Physical/Materials
Michael Jennings	<a href="mailto:jennigm@ua.edu">jennigm@ua.edu</a>	Shelby 2076	Organic
Robert Metzger	<a href="mailto:rmetzger@ua.edu">rmetzger@ua.edu</a>	Shelby 1088B	Physical
David Nikles	<a href="mailto:dnikles@ua.edu">dnikles@ua.edu</a>	Shelby 3097D	Inorganic
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
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:sstreet@ua.edu">sstreet@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
Russell Timkovich	<a href="mailto:rtimkovi@ua.edu">rtimkovi@ua.edu</a>	Shelby 3006B	(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.
- Practice good housekeeping. Keep your bench area clean and free from extraneous articles. Wipe up spills immediately. Dispose of waste (chemical and other such as 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

In order to create safer laboratories and also 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. These rules are not attempts 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 other 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.

vi. Glass mercury diffusion pumps should be housed in cases which can catch the mercury if the glass is broken.

**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.