Graduate Handbook

Department of Chemistry
Cleveland State University

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I. Doctoral Program in Clinical-Bioanalytical Chemistry

A. Introduction

The doctoral degree program in Clinical-Bioanalytical Chemistry is offered jointly by Cleveland State University (CSU) and the Cleveland Clinic. The program has a strong and unique focus on clinical and biomedical areas but is also versatile enough to serve students in the other traditional areas of chemistry. Its location in the Cleveland area benefits from the high concentration of world-renowned medical facilities, biomedical industries, and traditional chemical industries.

B. Program Curricula, Ph.D. in Clinical-Bioanalytical Chemistry

1. Overview

There are three doctoral tracks which students can pursue: 1) the General Clinical-Bioanalytical Chemistry track; 2) the Cellular and Molecular Medicine Specialization; and 3) the Accredited Clinical Chemistry Specialization.

Plan A: General Clinical-Bioanalytical Doctoral Track. This track gives flexibility to the student in designing their course of study. Courses of study include: 1) analytical chemistry, involving advanced analytical technologies such as mass spectrometry, HPLC, biosensors, nanotechnology, imaging, and other instrumental techniques; 2) biochemistry and molecular biology, applied to a wide range of physiologic systems and disease states; 3) pharmaceutical science, applied to the development of pharmaceutical therapeutics and pharmacokinetic studies; and 4) organic and inorganic chemistry, applied to the synthesis of novel organic and inorganic molecules with pertinent applications.

Plan B: Cellular and Molecular Medicine Specialization. The Cellular and Molecular Medicine Specialization (CMMS) offers unique opportunities for Biology, Chemistry, and Chemical and Biomedical Engineering doctoral students who wish to pursue a specialization in the application of modern cellular and molecular approaches to understanding disease causes and disease mechanisms. The Cellular and Molecular Medicine Specialization is not an independent academic program and does not replace existing doctoral programs. Thus, students in the General Clinical-Bioanalytical Doctoral track and the Accredited Doctoral Clinical Chemistry Specialization track may add this specialization to their program of study by completing the required courses in the specialization. The required courses are bioethics, biochemistry, molecular biology, and genetics, as well as one of the following courses: cell biology, physiology, or macromolecular structure and dynamics. This specialization makes available several graduate assistantships to allow outstanding candidates to concentrate on their research for two years.

Plan C: Accredited Clinical Chemistry Specialization. The doctoral program in Clinical Chemistry is the only doctoral program, both nationally and internationally, that is accredited by the Commission on Accreditation in Clinical Chemistry (CACC). The mission of the doctoral program in Clinical Chemistry is to give Ph.D. graduate students intensive didactic instruction in the field of clinical laboratory science and to give them appropriate biomedical research experience in their dissertation work. Knowledge of both clinical aspects and interpretation of test results, as well as knowledge of analytical techniques and various aspects of quality operation in the clinical laboratory, are central to the program's goals and mission.

Students are prepared for one of the following paths upon graduation:

1) to obtain further practical training in the field through clinical chemistry post-doctoral fellowships, to prepare them for careers as directors of clinical laboratories;
2) to directly assume other scientific positions in clinical laboratories, either at medical institutions or reference laboratories;
3) to assume positions in the *in vitro* diagnostics, pharmaceutical, or biotechnology industries, which are increasingly seeking scientists with knowledge of clinical chemistry.

The types of positions held by graduates (100 since the program's inception in 1973) include directors/co-directors/post-doctoral fellows of clinical laboratories (both in medical centers and reference laboratories; 35%), heads of other reference laboratories (toxicology/pharmaceutical/bioanalytical/pharmaceutical; 7%), scientists in the industry (*in vitro* diagnostics, pharmaceutical, others; 20%), faculty at academic institutions (primary position) (12%), research scientist positions (14%), and other positions (11%).

The program involves students in the activities of the Northeast Ohio Local Section of the American Association for Clinical Chemistry, fostering their professional development. Ph.D. graduates will obtain a Certificate in Doctoral Clinical Chemistry upon meeting all the requirements of this specialization (this will be in effect after receiving approval from the State of Ohio).

C. The Curriculum of the Study Plans

1. Overview of Plans A, B and C

The Ph.D. degree in the Department of Chemistry at CSU requires a minimum of 90 credit hours of courses. There are three plans for obtaining a Ph.D. degree.

(A) Clinical-Bioanalytical Chemistry;
(B) Clinical-Bioanalytical Chemistry with Cellular & Molecular Medicine Specialization CMMS);
(C) Clinical-Bioanalytical Chemistry with Clinical Chemistry Specialization (CCS).

Plans A and B each requires 28 credit hours of lecture courses, 2 credit hours of Chemistry Seminar (CHM 695/795), and 1 credit hour of Ph.D. Candidacy Exam (CHM 891).

Plan C requires 30 to 31 credit hours of coursework, 2 credit hours of Chemistry Seminar (CHM 695/795), and 1 credit hour of Ph.D. Candidacy Exam (CHM 891).

All Ph.D. students in plans A, B, and C

Full-time students (including those on teaching assistantships and all international students) are required to sign up for 9 credits of coursework every Fall and Spring semester until graduation. All plans require CHM 651/751 Clinical Chemistry I, CHM 652/752, Clinical Chemistry II, CHM 653/753 Advanced Biochemistry I, CHM 654/754, Advanced Biochemistry II. Each year after passing Candidacy Exam (CHM 891), students are required to register for 1 credit hour of Annual Research Report (CHM 790) until graduation (usually in Spring Semester). Students should choose a major research advisor within their first year of study and undertake their dissertation research project as soon as possible. The student, also, signs up for an appropriate number of credits of Advanced Chemistry Laboratory CHM 679 (pre-candidacy Ph.D. students) or CHM 779 (post-candidacy Ph.D. students) each semester, so that credits (including courses/seminars) for the semester total 9. Usually, Advanced Chemistry Laboratory credits are taken beginning in the second year of study and increase in the total proportion of credits in subsequent semesters, as the

Ph.D. student devotes a majority/all of time to his/her dissertation project. The student is required to orally defend a written proposal based on the candidate's on-going research and future research plans, registering for 1 credit CHM 891 Candidacy Exam in the Fall semester of the third year. In the semester of the final dissertation defense, the student will register for 1 credit CHM 899 Ph.D. Dissertation. A Ph.D. student must complete at least 90 credit hours of graduate study before becoming eligible for graduation. **University regulations limit the time of Ph.D. study to 10 years.**

The primary and ultimate objective of a Ph.D. degree is solid training in independent research and the completion of a major research project under the direction of the student's Research Advisor. Parallel writing and successful publication of research papers are also part and parcel of this graduate student training in research. Once the project is completed, the student will write a dissertation describing the project [prepared in the format prescribed by the College of Graduate Studies (https://graduate-studies.csuohio.edu/sites/csuohio.edu.graduate-studies/files/thesis-complete.pdf) and then defend the research and the written dissertation, evaluated by the Dissertation Committee.

Graduate courses are numbered 500-899. Courses numbered 500-599 are masters-level courses, which may be taken by pre-and post-candidacy doctoral students to fulfill course requirements, and are open to selected Cleveland State University graduating seniors. Courses 600-699 are masters-level courses to be enrolled in by masters and pre-candidacy doctoral students and are not open to undergraduate students. Courses numbered 700-899 are doctoral-level courses to be enrolled in by post-candidacy doctoral students. If a student has yet to pass CHM 891 Candidacy Exam, the student should register for masters-level courses (600 level). A student should register for doctoral-level courses (700 Level) only after the student has passed CHM 891 Candidacy Exam.

All PhD students are required to register for 600-800 level courses. **No course under 600 level will count toward the PhD degree unless a 600-800 class is not available**. For example, Advanced Biochemistry 653/753 and 654/754 are required for all plans A, B and C. Available classes for Master students are Biochemistry I and II (CHM 502/503). If a PhD student already has taken CHM502 and/or CHM503 they will be required to take 653/753 and 654/754.

2. Specific Courses in Plans of Study

2.1 PLAN A: PH.D. IN CLINICAL-BIOANALYTICAL CHEMISTRY. Plan A requires a student to take a minimum of 28 credit hours of lecture courses, from those listed below [at least one course is required from each of Categories I, II, and III), 2 credit hours of Chemistry Seminar (CHM 695/795, taken in year 1) and 1 credit hour of Ph.D. Candidacy Exam (CHM 891)]. Each year after passing candidacy exam (CHM891), students are required to register 1 credit hour of Annual Research Report (CHM790) (usually in Spring Semester) and for the appropriate number of credits of CHM 679/779 Advanced Chemistry Lab for dissertation research. In addition, the student registers for 1 credit hour of Ph.D. Dissertation (CHM 899) in the final semester. More courses may be suggested by a student's advisor based on the student's research needs. ***(* required courses***.)

Category I.	***Clinical Chemistry/Biochemistry***	
CHM 502	Biochemistry I	3 cr. hrs.
CHM 503	Biochemistry II	3 cr. hrs.
CHM 651/751	*Clinical Chemistry I	4 cr. hrs.
CHM 652/752	*Clinical Chemistry II	4 cr. hrs.
CHM 655/755	Biotechnology Techniques	4 cr. hrs.
CHM 653/753	*Advanced Biochemistry I	4 cr. hrs.
CHM 654/754	*Advanced Biochemistry II	4 cr. hrs.
CHM 658	Clinical Laboratory Topics: Instrumentation and Quality Operation	4 cr. hrs.
Category II.	***Analytical/Physical Chemistry***	
CHM 612/712	Advanced Analytical Chemistry	3 cr. hrs.
CHM 613/713	Advanced Electroanalytical Chemistry	4 cr. hrs.
CHM 614/714	Chromatography and Separation	4 cr. hrs.
CHM 615/715	Mass Spectrometry	3 cr. hrs.
CHM 616/716	Advanced Spectroscopic Methods	3 cr. hrs.
CHM 661/761	Macromolecular Structure and Dynamics	4 cr. hrs.
CHM 523	Statistical Thermodynamics	4 cr. hrs.
CHM 524	Chemical Kinetics	4 cr. hrs.
CHM 625/725	Quantum Mechanics	4 cr. hrs.
Category III.	***Organic/Inorganic Chemistry***	
CHM 631/731	Organic Structure and Bonding	4 cr. hrs.
CHM 630/730	Special Topics in Organic Chemistry	4 cr. hrs.
CHM 633/733	Organic Reactions	4 cr. hrs.
CHM 641/741	Inorganic Mechanism and Structures	4 cr. hrs.
CHM 640/740	Special Topics in Inorganic Chemistry	4 cr. hrs.
CHM 642/742	Theoretical Inorganic Chemistry	4 cr. hrs.
Additional Courses (Students may choose courses from this list to fulfill the 28-credit-hour requirement.)		
CHM 504	Environmental Chemistry	3 cr. hrs.
CHM 506	Environmental Chemistry Lab	2 cr. hrs.
CHM 507	Environmental Toxicology	3 cr. hrs.
CHM 510	Electronics for Chemistry Instruction	4 cr. hrs.
CHM 511	Instrumental Analysis	3 cr. hrs.
CHM 516	Instrumental Analysis Lab	4 cr. hrs.
CHM 517	Forensic Chemistry	3 cr. hrs.
CHM 521	Special Topics in Physical Chemistry	4 cr. hrs.
CHM 531	Advanced Organic Chemistry	2 cr. hrs.
CHM 541	Pharmacology I	3 cr. hrs.
CHM 542	Pharmacology II	3 cr. hrs.
CHM 557	Pharmaceutical Analysis Lab	3 cr. hrs.
CHM 551	Medicinal Chemistry I	3 cr. hrs.
CHM 552	Medicinal Chemistry II	3 cr. hrs.
CHM 561	Chemical Biology	3 cr. hrs.
CHM 596	Forensics Internship	3 cr. hrs.
CHM 604/704	Special Topics in Environmental Chemistry	3 cr. hrs.
CHM 611/711	Special Topics in Analytical Chemistry	3 cr. hrs.
CHM 605/705	Analytical Toxicology I	3 cr. hrs.
CHM 606/706	Analytical Toxicology II	3 cr. hrs.
CHM 618/718	X-ray Crystallography	3 cr. hrs.
CHM 650/750	Special Topics in Clinical Chemistry	1 cr. hr.
CHM 658/758	Advanced NMR Spectroscopy and Structural Biology	3 cr. hrs.
CHM 659/759	Clinical Chemistry Seminar	1 cr. hr.
CHM 656/756	Internship in Clinical Chemistry I	6 cr. hrs.
CHM 657/757	Internship in Clinical Chemistry II	6 cr. hrs.
CHM 691/791	Chemistry Internship	1 cr. hr.

2.2 PLAN B: PH.D. IN CLINICAL-BIOANALYTICAL CHEMISTRY WITH CELLULAR & MOLECULAR MEDICINE SPECIALIZATION (https://sciences.csuohio.edu/cmms/cmms). Plan B requires a student to take a minimum of 28 credit hours of lecture courses, from those listed below (at least one course is required from each of Categories I, II and III), 2 credit hours of Chemistry Seminar (CHM 695/795, taken in year 1), 1 credit hour of Ph.D. Candidacy Exam (CHM 891) and meet the core-course requirements of the molecular medicine specialization (https://sciences.csuohio.edu/cmms/cmms-curriculum). Each year after passing candidacy exam (CHM891), students are required to register 1 credit hour of Annual Research Report (CHM790) (usually in Spring Semester) and for the appropriate number of credits of CHM 679/779 Advanced Chemistry Lab for dissertation research. In addition, the student registers for 1 credit hour of Ph.D. Dissertation (CHM 899) in the final semester. More courses may be suggested by a student's advisor based on the student's research needs. ***(* required courses***.)

Category I.	***Clinical Chemistry/Biochemistry***	
CHM 502	Biochemistry I	3 cr. hrs.
CHM 503	Biochemistry II	3 cr. hrs.
CHM 651/751	*Clinical Chemistry I	4 cr. hrs.
CHM 652/752	*Clinical Chemistry II	4 cr. hrs.
CHM 655/755	Biotechnology Techniques (**core course**)	4 cr. hrs.
CHM 653/753	*Advanced Biochemistry I (**core course**)	4 cr. hrs.
CHM 654/754	*Advanced Biochemistry II (**core course**)	4 cr. hrs.
CHM 658	Clinical Laboratory Topics: Instrumentation and Quality Operation	4 cr. hrs.
Category II.	***Analytical/Physical Chemistry***	
CHM 612/712	Advanced Analytical Chemistry	3 cr. hrs.
CHM 613/713	Advanced Electroanalytical Chemistry	4 cr. hrs.
CHM 614/714	Chromatography and Separation	4 cr. hrs.
CHM 615/715	Mass Spectrometry	3 cr. hrs.
CHM 616/716	Advanced Spectroscopic Methods	3 cr. hrs.
CHM 661/761	Macromolecular Structure and Dynamics (**core course**)	4 cr. hrs.
CHM 523	Statistical Thermodynamics	4 cr. hrs.
CHM 524	Chemical Kinetics	4 cr. hrs.
CHM 625/725	Quantum Mechanics	4 cr. hrs.
Category III.	***Organic/Inorganic Chemistry***	
CHM 631/731	Organic Structure and Bonding	4 cr. hrs.
CHM 630/730	Special Topics in Organic Chemistry	4 cr. hrs.
CHM 633/733	Organic Reactions	4 cr. hrs.
CHM 641/741	Inorganic Mechanism and Structures	4 cr. hrs.
CHM 640/740	Special Topics in Inorganic Chemistry	4 cr. hrs.
CHM 642/742	Theoretical Inorganic Chemistry	4 cr. hrs.
Additional Courses (Can choose these courses to fulfill the 28-cr.hr. requirement after meeting the requirement of specific categories.)		
PHL 529	Bioethics (**core course**)	1 cr. hr.
CHM 504	Environmental Chemistry	3 cr. hrs.
CHM 506	Environmental Chemistry Lab	2 cr. hrs.
CHM 507	Environmental Toxicology	3 cr. hrs.
CHM 510	Electronics for Chemistry Instruction	4 cr. hrs.
CHM 511	Instrumental Analysis	3 cr. hrs.
CHM 516	Instrumental Analysis Lab	4 cr. hrs.
CHM 517	Forensic Chemistry	3 cr. hrs.
CHM 521	Special Topics in Physical Chemistry	4 cr. hrs.
CHM 531	Advanced Organic Chemistry	2 cr. hrs.
CHM 541	Pharmacology I	3 cr. hrs.
CHM 542	Pharmacology II	3 cr. hrs
CHM 557	Pharmaceutical Analysis Lab	3 cr. hrs.
CHM 551	Medicinal Chemistry I	3 cr. hrs.
CHM 552	Medicinal Chemistry II	3 cr. hrs.
CHM 561	Chemical Biology	3 cr. hrs.
CHM 596	Forensics Internship	3 cr. hrs.
CHM 604/704	Special Topics in Environmental Chemistry	3 cr. hrs.
CHM 611/711	Special Topics in Analytical Chemistry	3 cr. hrs.
CHM 605/705	Analytical Toxicology I	3 cr. hrs.
CHM 606/706	Analytical Toxicology II	3 cr. hrs.
CHM 618/718	X-ray Crystallography	3 cr. hrs.
CHM 650/750	Special Topics in Clinical Chemistry	1 cr. hr.
CHM 658/758	Advanced NMR Spectroscopy and Structural Biology	3 cr. hrs.
CHM 659/759	Clinical Chemistry Seminar	1 cr. hr.
CHM 656/756	Internship in Clinical Chemistry I	6 cr. hrs.
CHM 657/757	Internship in Clinical Chemistry II	6 cr. hrs.
CHM 691/791	Chemistry Internship	1 cr. hr.

2.3 PLAN C: PH.D. IN CLINICAL-BIOANALYTICAL CHEMISTRY WITH COMACC CERTIFIED CLINICAL CHEMISTRY SPECIALIZATION

Plan C has the required courses listed below, in addition to 2 credit hours of Chemistry Seminar (CHM 695/795, taken in year 1) and 1 credit hour of Ph.D. Candidacy Exam (CHM 891). Each year after passing candidacy exam (CHM891), students are required to register 1 credit hour of Annual Research Report (CHM790) (usually in Spring Semester) and for the appropriate number of credits of CHM 679/779 Advanced Chemistry Lab for dissertation research. In addition, the student registers for 1 credit hour of Ph.D. Dissertation (CHM 899) in the final semester. More courses may be suggested by a student's advisor based on the student's research needs.

Course	**Credits per course**
Clinical Chemistry I (CHM 651/751)	4 cr. hrs.
Clinical Chemistry II (CHM 652/752)	4 cr. hrs.
Advanced Biochemistry I (CHM 653/753)	4 cr. hrs.
Advanced Biochemistry II (CHM 654/754)	4 cr. hrs.
Special Topics in Clinical Chemistry (CHM 750)	1 cr. hr., 4 courses
Clinical Laboratory Topics: Instrumentation and Quality Operation (CHM 658)	4 cr. hrs.
Internship in Clinical Chemistry I (CHM 756)	3 cr. hrs.
Clinical Chemistry Seminar (CHM 759)	1 cr. hr., 2 courses
One of the following:	
Biotechnology Techniques I (CHM 655/755)	4 cr. hrs.
Pharmaceutical Analysis Laboratory (CHM 557)	3 cr. hrs.
Total	**32/33 credits**

Note: Students who wish to specialize in both Clinical Chemistry and Cellular & Molecular Medicine can do so by additionally meeting the core-course requirements of the Cellular and Molecular Medicine specialization (https://sciences.csuohio.edu/cmms/cmms-curriculum).

2.3.1 Admission into the Certificate in Doctoral Clinical Chemistry Program

The following are requirements for admission into the ComACC accredited program:

1. Holding regular graduate admittance status in the graduate chemistry program;
2. A minimum B (3.0) grade in the Clinical Chemistry 1 (CHM 651/751), Clinical Chemistry 2 (CHM 652/752), Advanced Biochemistry 1 (CHM 653/753), and Advanced Biochemistry 2 (CHM 654/754);
3. Must have.3.25 cumulative GPA for the above courses

The student who qualifies after taking courses in the first year and intends to study in the Certificate in Doctoral Clinical Chemistry program will meet with the Director of Clinical Chemistry to fill out and sign the *Intent to Complete the Certificate in Doctoral Clinical Chemistry Form* (on *Department Website: Forms for Current Students* link) in which a plan for completion of the coursework is devised, the criteria for the awarding of the Certificate is explained and a commitment to annually meet with the Director is made.

2.3.2 Requirements for Completing the Certificate in Doctoral Clinical Chemistry Program

The completion requirement of the certificate program are as follows:

1. A minimum B (3.0) grade in each letter grade course [for all the CHM 750 courses, having an average of B (3.0)] of the certificate program and S grades in the Internship in Clinical Chemistry (CHM 756) and Clinical Chemistry Seminar (CHM 759) courses
2. A cumulative GPA of 3.5 or higher at graduation
3. Meet all the requirements for a Ph.D. degree in Clinical-Bioanalytical Chemistry

2.4 Dissertation Research

Research culminating in the successful defense of a dissertation is required in all three plans of study (Plan A, Plan B, Plan C). Doctoral students in the program have opportunities to do their dissertation research for either CSU faculty in the Department of Chemistry or appointed faculty at the Lerner Research Institute at the Cleveland Clinic. Affiliated faculty at the Robert J. Tomsich Pathology and Laboratory Medicine Institute of the Cleveland Clinic may also serve as dissertation research mentors. CSU chemistry faculty perform research in the following areas: mass spectrometry, HPLC, biomedical imaging, biosensors, nanotechnology, computational chemistry, coagulation biochemistry, protein chemistry, microarrays, molecular biology, cancer biochemistry, metabolomics, proteomics, pharmacokinetics, development of novel therapeutics, and organic and inorganic synthesis. The Lerner Research Institute at Cleveland Clinic undertakes basic biomedical research in multiple areas, as reflected by the various departments in the institute: biomedical engineering, cancer biology, cardiovascular and metabolic sciences, genomic medicine, inflammation and immunity, neurosciences, ophthalmic research, translational hematology, and oncology research and clinical and translational research.

2.4.1 Selection of Dissertation Research Advisor

A Research Advisor is to be selected in the first year of study, so that the student begins research by summer. The Research Advisor must have a faculty appointment in the Department of Chemistry, either a CSU Chemistry faculty member or a Cleveland Clinic faculty member who has a faculty appointment in the Department of Chemistry. Eligible Cleveland Clinic faculty who can take on Ph.D. students to do dissertation research in their lab are either in the Lerner Research Institute or the Robert J. Tomsich Pathology and Laboratory Medicine Institute (a list of eligible affiliated faculty at the Cleveland Clinic is given on the *Department of Chemistry website: Affiliated Faculty link*). A doctoral student may do one or two 6-week rotations in one or two faculty labs before deciding. Rotations are not mandatory but may be requested by either the student or the faculty member. The laboratory in which a student does his/her dissertation work depends not only on the student's choice but also the faculty member accepting the student. A faculty member is under no obligation to accept a student in their lab. Upon selecting a Research Advisor (and a CSU Academic Advisor, if working for an off-CSU-campus research advisor), the student should submit an *Advisor Notification Form* (on *Department of Chemistry website: Forms for Current Students link*) to the Department of Chemistry Director of Graduate Programs.

2.4.2 Dissertation Committee

The student, in consultation with their research advisor, will choose faculty members (with their consent) to serve on the student's Dissertation Committee. The faculty members MUST have Graduate Faculty status or be approved by the Dean of the College of Graduate Studies. The Dissertation Committee consists of at least 4 faculty members within the Chemistry Ph.D. program (CSU faculty and affiliated faculty from the Cleveland Clinic), one of which is the Research Advisor, and one member outside the Chemistry Ph.D. program. If choosing an off-CSU-campus research advisor, one of the committee members must be the CSU Academic Advisor. Upon the formation of the Committee, the student must complete and submit a *Thesis/Dissertation Committee Notification* form (on *Department of Chemistry website: Forms for Current Students* link) to the Department of Chemistry Director of Graduate Programs.

The Dissertation Committee decides whether the student passes the Candidacy Exam (CHM 891) to officially become a candidate for the Ph.D. degree. After passing candidacy exam (CHM891), the Committee also meets once a year with the student (Annual Research Report, CHM 790) to review the progress of the student's research and to make recommendations. The Committee can also meet more

frequently if necessary. Finally, the Committee decides whether the Ph.D. is to be awarded to the candidate after the research is completed and after evaluating the student's defense of the dissertation.

The research is completed when the scholarship requirements are accomplished. The time required for the completion of research and the defense of the dissertation is solely dependent on the student's dissertation committee. The Research Advisor, along with the Committee, establishes scholarship expectations required for graduation, such as the number of publications in peer reviewed journals and any other requirements as they may see fit and appropriate. The Research Advisor decides when a manuscript is ready for publication, where it is to be published and if there are to be any co-authors. The Dissertation Committee should inform the student of the scholarship expectations required for graduation early on and a record of the communication should be emailed to the student, committee members, and the Chemistry Director of Graduate Programs, as well as put in the student's file.

2.4.3 CHM 891 Candidacy Exam

Students are not considered official candidates for the Ph.D. degree until they have successfully defended before their dissertation committee a written proposal based on the candidate's on-going research and future research plans. Students are required to register for CHM 891 Candidacy Exam in the semester they will defend their proposal (Fall semester of the third year).

The student is required to prepare a written proposal that has a thoroughly prepared abstract, background, initial results, and experimental plans. It is written in an NIH grant proposal format with specific aims and discussion of how these aims will be obtained. This written proposal is to be given to the committee members at least one week before the scheduled date of defense. The student is also responsible to post, several days before the candidacy exam, a flyer at various locations in the department (giving details as given below for the email notification). Also, the student needs to email the chemistry office staff, who will forward it to department personnel, (graduate students, faculty, and professional staff) pertinent details of the defense: 1) in the subject line -"Candidacy Exam for X" (X is the name of student), and the date, time, and room and 2) in the email proper - repeat the information in the subject line and adding the research advisor's name and the title of the proposal. The flyer is also to be attached to the email.

The student gives a presentation of his/her proposal to an extended audience of faculty and students and then the committee convenes with the student in a question-and-answer session. In the question-and-answer session, the student defends the merits of the proposal, as well as having his/her scientific knowledge and critical thinking skills assessed. The student is evaluated by the committee, basing its evaluation on the written proposal, the seminar presentation, and the performance during the question and answer period. The committee can take one of the following actions after the student's defense: 1) recommend acceptance of the student as an official Ph.D. candidate; 2) recommend a re-writing and/or a re-defense of the proposal (the latter to be done within three months); or 3) deny admittance of the student into the Ph.D. program (this option is usually exercised after a second defense of the proposal has failed). A majority vote of the committee is required for a given outcome. The student is given only two chances to pass. Students who do not pass CHM 891 cannot advance to doctoral studies and are only allowed to pursue thesis-based MS degrees.

Upon passing CHM 891, the student is required to complete and submit to the Department of Chemistry Director of Graduate Programs a *Thesis and Dissertation Proposal Approval* form (on the *Department of Chemistry website: Forms for Current Students link*) on the day of the candidacy exam.

2.4.4 Annual Research Report, CHM 790

Each year after passing Candidacy Exam (CHM 891), students are required to register for 1 credit hour of Annual Research Report (**CHM 790**, not 690!) until graduation (usually in Spring Semester). The student gives an oral presentation before his/her Dissertation Committee covering the results in the research that have been accomplished. The Dissertation Committee evaluates the student's progress and gives guidance and recommendations to the student. An *Annual Research Report form* (on the *Department of Chemistry website: Forms for Current Students link*) is to be printed out and brought to the committee meeting by the student. This form is to be filled out by the Research Advisor and the Dissertation Committee, evaluating the student's progress in different areas (literature review, bench work, lab notebook maintenance and retention of research data for experiments performed and presented in the progress report, manuscript work, conference poster/talk performance, seminar talks, group meeting preparation). The student will attach to the form a summary of work done, as well as provide a listing of manuscripts and conference presentations (published, submitted, and to be submitted). The completed form, with attachments, is submitted by the student to the Department of Chemistry Director of the Graduate Program, who submits a satisfactory (S) or unsatisfactory grade (U) upon recommendation from the committee. Grade (S) satisfactory progress is made, even with some aspects that the committee points out that need improvement. Grade (U) may be assigned in subsequent CHM 790 courses if the student is not sufficiently responsive to the committee's recommendation(s) for improvement in the area(s) pointed out in previous CHM 790 courses. Grade (U) is also assigned if there is a serious issue of performance. Such deficiencies in performance include: non-adherence to policy and procedures; significant dereliction in doing labwork or other scholarship activities; unsafe laboratory practices; not displaying professionalism in interactions with peers, faculty, and colleagues within and external to the university; being disruptive to lab teamwork or other aspects of the lab; plagiarism; and/or dishonesty in recording and reporting research results. These serious issues of performance may be grounds for immediate dismissal from the graduate program (see section).

2.4.5 Advanced Chemistry Laboratory, CHM 679/779

Students are to sign up for credits of Advanced Chemistry Laboratory CHM 679 (pre-candidacy Ph.D. students) or **CHM 779 (post-candidacy Ph.D. students)** for each Fall and Spring semester after the first year, with these credits accounting for research work done. The number of CHM 679/779 credits in which the student enrolls is nine (9) minus any other course credits. Advanced Chemistry Laboratory is graded on a satisfactory/unsatisfactory basis. The criteria mentioned for assigning (S) and (U) grades for CHM 690/790 are the same for CHM 679/779. The student's research advisor (or CSU faculty member in charge of the course in consultation with the external research advisor) makes the judgement based on these criteria and who assigns the S/U grade.

2.4.6 Dissertation Defense (Dissertation Research, CHM 899)

The student is required to enroll for 1 credit of Dissertation Research CHM 899 in the semester in which the dissertation is defended. The Ph.D. candidate writes the dissertation in close consultation with his/her major advisor, in the format prescribed by the College of Graduate Studies (https://graduate-studies.csuohio.edu/sites/csuohio.edu.graduate-studies/files/thesis-complete.pdf). A final draft of the dissertation is to be given to the Dissertation Committee members at least one week before the scheduled date of defense. The student is also responsible to post, several days before the dissertation defense, a flyer (giving details as given below for the email notification) at various locations in the department. Also, the student needs to email the chemistry office staff, who will forward it to department personnel (graduate students, faculty, and professional staff) pertinent details of the defense:

1) in the subject line -"Dissertation Defense for X" (X is the name of student), and the date, time, and room and 2) in the email proper - repeat the information in the subject line and adding the research advisor's name and the title of the proposal. The flyer is also to be attached to the email.

Concerning the format of the defense, a seminar is given to the entire department, followed by a defense of the student's dissertation before the Dissertation Committee. The Committee can take one of the following actions: 1) recommend conferral of the Ph.D. degree; 2) recommend conferral of the Ph.D. degree contingent upon revisions of the dissertation; 3) deny the Ph.D. degree, either requiring further work for a re-defense or an out-right denial. A majority vote of the committee is required for a given outcome.

2.4.7 Post Dissertation Defense

After the Dissertation Committee has passed the candidate in defense of the dissertation and has accepted the written dissertation (with any modifications made), the candidate submits the dissertation to the College of Graduate Studies for review. Instructions for submission to the Graduate College must be followed as given on the website (https://graduate-studies.csuohio.edu/sites/csuohio.edu.graduate-studies/files/At-A-Glance.pdf). Following acceptance of the dissertation format by the College of Graduate Studies, follow the instructions given on the pdf on the above-referenced website for the posting of the dissertation on Ohio Link. **The final electronic version must be received in Graduate Student Services no later than the end of the week that follows the final day of the term.** If the electronic version is not received by this date, the student's graduation term will be changed to the next term. Other responsibilities/paperwork required are (on *Department of Chemistry website: Forms for Current Students link*):

- File the *Application for a Master's and Doctoral Degree* form (two semesters before graduation). (Note, this pdf is entitled *Graduate Graduation Application* on the Chemistry website)
- File the *Notice of Completion for Doctoral Degree Requirements* form (due at the end of the final semester). (Note, this pdf is entitled *Doctoral Completion* on the Chemistry website)
- Department check-out, file the *Laboratory Exit* form (due when the lab work is completed).

D. Timelines for Graduate Studies

All forms referred to below are on the *Department of Chemistry website: Forms for Current Students* link.

1. Timeline for Students in Plans A and B

a. **First Year** – Director of Graduate Programs is the academic advisor

- **Fall and Spring**
  - Attendance at Graduate Student Orientation is required (Fall)
  - Register for a total of **9** credit hours per semester except for summer.
    - CHM 651 and 652/752 Clinical Chemistry I and II are required
    - CHM 653/753 and 654/754 Advanced Biochemistry I and II are required
- **Summer ---** research officially starts
  - Choose an academic/research advisor and turn in the *Advisor Notification* form to the Department of Chemistry Director of Graduate Programs before **July 30**.
- **Spoken English Test**
  - TA must pass the SPEAK test/ESL courses or the student will lose the TA contract for the following years.

b. **Second Year**

- Attendance at Graduate Student Orientation is required (Fall)
- Register for a total of **9** credit hours per semester except for summer.
- Continue research with the chosen research advisor.
- Choose your Dissertation Committee members.
- Submit *Thesis/Dissertation Committee Notification* form to Department of Chemistry Director of Graduate Programs in the Spring semester (due on **March 1**).

c. Third Year

- Attendance at Graduate Student Orientation is required (Fall)
- Register for a total of **9** credit hours per semester except for summer.
- Continue research with the chosen research advisor.
- Register **1** credit hour of Candidacy Examination (CHM 891) and defend your research proposal in the Fall semester (the 1st or 2nd attempt). If you cannot pass on the 1st attempt, try it again within three months.
- If you pass the Candidacy Examination, turn in the *Thesis and Dissertation Proposal Approval* form to the Department of Chemistry Director of Graduate Programs (due on the defense day).

d. **Subsequent Years** (Up to and Including Graduation Year)

- Attendance at Graduate Student Orientation is required (Fall)
- Register for a total of **9** credit hours per semester except for summer.
- Register **1** credit hour of Annual Research Report (CHM790) in the **Spring semester** and submit the *Annual Research Report* form including Research Advisor's and Dissertation Committee's comments to the Department of Chemistry Director of Graduate Programs (due on **May 1**).
- Continue research with the chosen research advisor.
- **File the *Application for a Masters and Doctoral Degree* form (two semesters before graduation**). (Note, you can apply in your CSU CampusNet account, click on the Graduation tab. A pdf is entitled *Graduate Graduation Application* on the Chemistry website)

e. Graduation Semester

- Attendance at Graduate Student Orientation is required (if Fall)
- Register **1** credit hour of Dissertation Research (CHM 899)
- Register for a total of **9** credit hours
- Continue research and writing dissertation.
- File the *Application for a Master's and Doctoral Degree* form (two semesters before graduation). (Note, this pdf is entitled *Graduate Graduation Application* on the Chemistry website)
- File Doctoral Commencement Form by **March 1.**
- Ph.D. Dissertation Defense.
- File the *Notice of Completion for Doctoral Degree Requirements* form (due at the end of the final semester). (Note, this pdf is entitled *Doctoral Completion* on the Chemistry website)
- Department check-out, file the *Laboratory Exit* form (due when completed the lab work).
- Commencement (**May** or **December**).
- Degree Awarded.
- Dissertation Published.

2. Timeline for Plan C: Doctoral Program in Clinical Chemistry

(Certificate in Doctoral Clinical Chemistry)

Students in the doctoral program in Clinical Chemistry spend time in courses and research, as summarized below. Doctoral clinical chemistry students meet with the Director of Clinical Chemistry on an annual basis to assure that they on track in taking the required courses in the program.

a. Year One:

- ***Fall and Spring***
  - Attendance at Graduate Student Orientation is required (Fall)
  - Take CHM 651 and 652/752 Clinical Chemistry I and II
  - Take CHM 653/753 and 654/754 Advanced Biochemistry I and II
  - Take CHM 695 Chemistry Seminar (two courses).
- ***Summer*** **---** research officially starts
  - Choose an academic/research advisor and turn in the *Advisor Notification* form to Department of Chemistry Director of Graduate Programs before **July 30**.
  - The student who qualifies and intends to study in the Certificate in Doctoral Clinical Chemistry program will meet with the Director of Clinical Chemistry to fill out and sign the *Intent to Complete the Certificate in Doctoral Clinical Chemistry* form
- ***Spoken English Test***
  - TA must pass the SPEAK test/ESL courses or the student will lose the TA contract for the following years.

b. Year Two:

- ***Fall***
  - Attendance at Graduate Student Orientation is required
  - Take CHM 655 Biotechnology Techniques or CHM 557 Pharmaceutical Analysis Laboratory
  - Register for a total of **9** credit hours, which includes 5-6 credits of CHM 679 Advanced Chemistry Lab for research, or fewer credits if the research advisor requires another course
- ***Spring***
  - Take CHM 658/758 Clinical Laboratory Topics: Instrumentation and Quality Operation.
  - Take CHM 750 Special Topics in Clinical Chemistry
  - Register for a total of **9** credit hours, which includes 4 credits of CHM 679 Advanced Chemistry Lab for research, or less credits if the research advisor requires another course
  - Submit *Thesis/Dissertation Committee Notification* form to Department of Chemistry Director of Graduate Programs (due on **March 1**).
- ***Summer***
  - Meet with Director of Clinical Chemistry to discuss progress in clinical chemistry curriculum and to get direction on clinical chemistry courses to take in the next year

c. Year Three:

- ***Fall***
  - Attendance at Graduate Student Orientation is required (Fall)
  - Take CHM 759 Clinical Chemistry Seminar
  - Register for a total of **9** credit hours, which includes 8 credits of CHM 679 Advanced Chemistry Lab for research, or less credits if the research advisor requires another course
  - Register **1** credit hour of Candidacy Examination (CHM 891) and defend your research proposal in Fall semester (the 1st or 2nd attempt). If you cannot pass in the 1st attempt, try it again within three months. If you pass the Candidacy Examination, turn in the *Thesis and*

Dissertation Proposal Approval form to Department of Chemistry Director of Graduate Programs (due on the defense day).

- ***Spring***
  - Take CHM 750 Special Topics in Clinical Chemistry
  - Can take the CHM 756 Internship in Clinical Chemistry course after passing proposal defense in Spring Year 3 or any semester after.
  - Register for a total of **9** credit hours, which includes credits for CHM 779 Advanced Chemistry Lab for research to make up the 9 credits which can include CHM 756 or any other courses
- ***Summer***
  - Meet with Director of Clinical Chemistry to discuss progress in clinical chemistry curriculum and to get direction on clinical chemistry courses to take in the next year

d. <u>Year Four and Beyond</u>:

- Attendance at Graduate Student Orientation is required (Fall)
- Students continue taking CHM 759 Clinical Chemistry Seminar in Fall and CHM 750 Special Topics in Clinical Chemistry course in Spring [or Clinical Chemistry Seminar if the Special Topics series (4 courses) is finished].
- Register for a total of 9 credit hours for each semester, which includes credits for CHM 779 Advanced Chemistry Lab for research to make up the 9 credits which includes CHM 756 (if not taken previously) or any other courses
- **File the *Application for a Masters and Doctoral Degree* form (two semesters before graduation**). (Note, you can apply in your CSU CampusNet account, click on the Graduation tab. A pdf is entitled *Graduate Graduation Application* on the Chemistry website)
- Register **1** credit hour of Annual Research Report (CHM790) in the **Spring semester** and submit *Annual Research Report* form including Research Advisor's and Dissertation Committee's comments to the Department of Chemistry Director of Graduate Programs (due on **May 1**).
- Meet in Summer with Director of Clinical Chemistry to discuss progress in curriculum and to get direction on clinical chemistry courses to take in the next year

e. <u>Graduation Semester</u>

- Attendance at Graduate Student Orientation is required (if Fall)
- Register **1** credit hour of Dissertation Research (CHM 899)
- Register for a total of **9** credit hours
- Continue research and writing dissertation.
- File the *Application for a Master's and Doctoral Degree* form (two semesters prior to graduation). (Note, this pdf is entitled *Graduate Graduation Application* on the Chemistry website)
- File Doctoral Commencement Form by **March 1.**
- Ph.D. Dissertation Defense
- File the *Notice of Completion for Doctoral Degree Requirements* form (due at the end of final semester). (Note, this pdf is entitled *Doctoral Completion* on the Chemistry website)
- Department check-out, file the *Laboratory Exit* form (due when completed the lab work).
- Commencement (**May** or **December**).
- Degree Awarded.
- Dissertation Published.
- Meet with Director of Clinical Chemistry for evaluation of program

II. Masters Program in Chemistry

The M.S. degree in Department of Chemistry at CSU requires a minimum of 32 credit hours. There are two plans for obtaining a M.S. degree in chemistry given below. **University regulations limit the time of M.S. study to a 6-year period.**

Plan A (Thesis M.S.) is designed for graduate students with a research focus. This plan requires a minimum of 16 credit hours of Advanced Chemistry Lab (CHM 679) and M.S. Thesis (CHM 699), 2 credit hours of Chemistry Seminar (CHM 695/795) and 14 credit hours of lecture courses from at least three categories of courses listed below. The primary objective of a Thesis M.S. degree is the completion of a research project under the direction of the student's research advisor. Once the project is completed, the student must write a thesis describing the project [prepared in the format prescribed by the College of Graduate Studies (https://graduate-studies.csuohio.edu/sites/csuohio.edu.graduate-studies/files/thesis-complete.pdf)] and acceptable to the student's M.S Thesis Committee. The student will publicly defend the research and the written thesis. A M.S. Thesis Committee should consist of at least 3 faculty members with graduate faculty status, one of which is the student's research advisor. More courses may be suggested by a student's research advisor based on the student's research needs.

Plan B (Non-Thesis M.S.) is designed for graduate students who are currently working in chemistry related fields with a focus on advanced chemistry courses. This plan requires a minimum of 30 credit hours of lecture courses from at least three categories listed below and 2 credit hours of Chemistry Seminar (CHM 695/795).

Courses

Category I.	***Analytical Chemistry***	
CHM 612/712	Advanced Analytical Chemistry	3 cr. hrs.
CHM 613/713	Advanced Electroanalytical Chemistry	4 cr. hrs.
CHM 614/714	Chromatography and Separation	4 cr. hrs.
CHM 615/715	Mass Spectrometry	3 cr. hrs.
CHM 616/716	Advanced Spectroscopic Methods	3 cr. hrs.
CHM 661/761	Macromolecular Structure and Dynamics	4 cr. hrs.
Category II.	***Organic Chemistry***	
CHM 531	Advanced Organic Chemistry	2 cr. hrs.
CHM 630/730	Special Topics in Organic Chemistry	4 cr. hrs.
CHM 631/731	Organic Structure and Bonding	4 cr. hrs.
CHM 633/733	Organic Reactions	4 cr. hrs
Category III	***Environmental Chemistry***	
CHM 504	Environmental Chemistry	3 cr. hrs.
CHM 506	Environmental Chemistry Lab	2 cr. hrs.
CHM 507	Environmental Toxicology	3 cr. hrs.
CHM 604/704	Special Topics in Environmental Chemistry	3 cr. hrs.

III. Regulations for Masters and Ph.D. Graduate Students

A. Maintaining Academic and Teaching Assistant Standing

To be considered in Good Academic Standing, a graduate student must maintain a graduate grade-point average of 3.0 or above. A student on a teaching assistantship must maintain a GPA of 3.25 or above.

1. Academic Warning and Dismissal

1.1 Optional Dismissal

If, in 400- to 800-level courses, a student receives:

a. one grade of F, or
b. two grades of less than B, or
c. two grades of NS, or
d. two grades of U

Then the individual MUST be reviewed by the Graduate Program Committee to determine his or her ability to continue in graduate school. If the Graduate Program Committee determines that dismissal is in order, this recommendation is made to the Dean of the College of Graduate Studies for review and notification of the student. If it is determined that the student may continue in the graduate program, the Graduate Program Committee will notify the Dean of the College of Graduate Studies and the student, in writing, regarding the grounds under which continuation is possible.

1.2 Mandatory Dismissal

If, in 400- to 800-level courses, a student receives:

a. two F grades, or
b. accumulates a total of nine credit hours of B- or less grades and has a cumulative grade-point average below 3.0

then the student will be dismissed automatically from the University by the Dean of the College of Graduate Studies.

1.3 Other Grounds for Dismissal

A serious issue of deficiency in research and scholarship performance can also lead to dismissal, as judged by the student's dissertation committee or research advisor. Such deficiencies in performance include:

- non-adherence to policy and procedures
- signicant dereliction in doing labwork or other scholarship activities
- unsafe laboratory practices
- not displaying professionalism in interactions with peers, faculty, and colleagues within and external to the university
- being disruptive to lab teamwork or other aspects of the lab
- plagiarism
- dishonesty in recording and reporting research results
- insufficiently responsive to feedback and directives from the student's dissertation committee or research advisor.
- Non-adherence to policy and procedures in one or more course(s).

2. Other Regulations

Other regulations concerning graduate studies are given on College of Graduate Studies website (https://catalog.csuohio.edu/content.php?catoid=36&navoid=2902) concerning the following:

- Regulations for Student Conduct
- Student Academic Responsibility
- Academic Misconduct
- Plagiarism Policy
- Academic and Scientific Integrity
- Research Involving Human Subjects

The student is REQUIRED to know these policies. Also visit this website for other relevant information.

2.1. Addressing Concerns about Student Performance. If circumstances arise that create concern on the part of faculty about the performance of a student enrolled in the program, faculty (the research advisor or the academic advisor) will clearly convey to the student the nature of and basis for their concerns, any relevant and appropriate consequences for the student, and conditions set by the student's dissertation committee (or research advisor or academic advisor) that the student must meet to satisfactorily resolve the concern. If the student disagrees with decisions or actions taken by the above-mentioned faculty, the student may appeal the decision by contacting the Graduate Program Director and the Department Chairperson. The student may also appeal any dismissal recommendation as specified by College of Graduate studies procedures.

IV. Chemistry Teaching Assistantship: Expectations, Responsibilities, Terms of the Award and Pertinent Information

A. Overview

- Teaching assistantships provide students with opportunities to develop professionally while servicing the department.
- Teaching assistantships are regarded as apprenticeships. Students become more effective members of their professions through formal instruction, administrative experiences, and interaction with faculty in teaching and research.
- The Department of Chemistry offers teaching assistantships to its qualified Ph.D. students on **competitive basis**.
- A teaching assistantship is renewed on **annual basis**, for up to five years.
- If a Teaching Assistant (TA) cannot finish his/her Ph.D. studies within five academic years, he/she may apply for one-year extension from the Graduate Committee with justification. **No Ph.D. student will receive a teaching assistantship after the 6th year appointment**.
- The TA may be assigned to one or more of the following responsibilities
    - Instructing in Teaching Labs
    - Overseeing Instrumentation
    - Doing Recitation/Tutoring
    - Proctoring
    - Administrative Assignments

B. Conditions of the Award

- Students must be in the Chemistry Ph.D. Program and have a GPA $\geq$ 3.25 to qualify for, and to retain, an assistantship.
- TAs must register for a minimum of 9 credit hours per semester at the 500-level or above courses.
- All non-native English speaking students assigned any teaching assistant duties are required to take the Speak Test prior to approval of the contract.
- A TA's workload must not exceed 20 hours per week.
- Students holding a full teaching assistantship may not hold any other form of employment either within the University or off-campus.

C. Expectations

- TAs play a very important role in presenting chemistry subjects and helping students understand chemistry course materials.
- Our undergraduate students' success is partly based on the professionalism of the TAs.
- It is imperative that TAs understand and fulfill their responsibilities.

D. Responsibilities of Teaching Assistants Instructing in Labs

- Check with the preparation TA to make sure the materials needed for lab classes are properly prepared and ready for use.
- Show up in the lab at least 15 min before a lab class starts.
- Introduce students to each experiment.
- Actively provide advice and assistance to students as they conduct work in the lab.
- Monitor and strictly enforce safety rules, in particular those related to PPE and safe laboratory practices.

- Lookout for unsafe situations.
- Be prepared for emergencies.
- Evaluate students' performance by observing them carry out experiments.
- Grade laboratory reports and exams.
- Attend weekly TA staff meetings.

E. Responsibilities of Teaching Assistant Overseeing Instrumentation

- Perform routine instrument maintenance.
- Prepare samples and solutions.
- Run samples from clients.
- Assist new instrument users.
- Place purchase orders.
- Keep instrument labs clean and organized.
- Perform other duties assigned by the manager.

F. Responsibilities of Teaching Assistant Doing Recitation/Tutoring

- Hold assigned office hours.
- Interact with students in a professional manner.
- Provide help to group or individual students when requested.
- Grade problem sets and exams when requested.
- Inform faculty instructors for problems and difficulties which students encountered.
- Attend weekly TA staff meetings.

G. Responsibilities of Teaching Assistants Doing Proctoring

- All teaching assistants will be assigned as proctors to one or more courses.
- Show up on time as specified by the faculty member in charge of the course.
- Pass out exams and be involved in collecting and organizing the completed exams.
- Monitor students in taking the exam for cheating.
- If there is time conflict in proctoring any exam, it is the responsibility of the TA to switch with another TA to proctor that exam. In doing this, the two TAs who have switched proctoring assignments for a particular exams are to notify the faculty members of the two affected courses of this switch.

H. Termination of a Teaching Assistant's Contract

A teaching assistant's contract will be terminated, if the TA

- Cannot pass the Speak Test or ESL courses.
- Cannot pass Ph.D. Candidacy Exam after two attempts.
- Does not register for the appropriate amount (9 cr. hrs. or more) and level (500-level or above) of coursework.
- Is not in good academic standing (GPA < 3.25).
- Is not doing their duties satisfactorily as determined by the Instructor of Record for the course and/or the Chair of the Chemistry Department (2 offenses).
- Exceeds the five-year limit.

I. Teaching Assistantship Stipend

Chemistry Department offers a stipend of $21,000 per academic year (divided equally among the Fall, Spring, and Summer semesters), and a full annual tuition scholarship. The tuition scholarship waives all tuition and fees (except for a one-time registration fee). The offer of an assistantship is conditional, subject to the availability of sufficient funds from the State of Ohio. The stipend will increase to $22,500 per academic year after passing "PhD Candidacy Exam (CHM891).

J. Teaching Assistant Handbook

A *Teaching Assistant Handbook* is included at the end of this document (Appendix A) which gives pertinent information on carrying out the responsibilities of a Teaching Assistant. The student is responsible for reading and doing what is contained in this handbook.

V. Safety and Environmental Requirements for Teaching and Research Labs

Note: the following applies for students in labs at Cleveland State and generally applies to labs at the Cleveland Clinic (or other external labs). Students working in labs at institutions external to Cleveland State are required to adhere to the health, safety and environmental regulations of that institution.

Students are REQUIRED to read and IMPLEMENT the practices in the documents of the Chemical Hygiene Plan, which are listed below and given on the website https://www.csuohio.edu/ehs/chemical-hygiene-plan-0 . These documents give comprehensive information on all aspects of safety and environmental regulations and procedures that a graduate student should know, both in doing research as a graduate student, as well as implementing these practices in positions that the graduate will assume in a future career.

Chemical Hygiene Plan

- *Chemical Hygiene Responsibilities*
- *Chemical Management*
- *Chemical Waste Management*
- *Laboratory Equipment and Facilities*
- *Employment Health & PPE*
- *Standard Operating Procedures*
- *Safety Training*
- *Record Keeping*

Some pertinent points in these documents are given in Section A (Safety in Teaching and Research Labs) and Section B (Environmental Regulations) below. Although pertinent points are given below, students are responsible for all practices as given by the documents listed above in the Chemical Hygiene Plan.

A. Safety in Teaching and Research Labs

1. Laboratory Safety Agreement

You are required to read, sign and adhere to the *Laboratory Safety Agreement* given in Appendix B.

2. General safety

Safe lab work requires attention to three ‘targets’: yourself, other people inside the lab, and the outside world.

Protecting yourself and other people inside the lab. There are three things you can do to keep yourself and others safe while working in the lab:

- Set up barriers
  - Wear goggles at all times
  - Wear protective clothing (*e.g.* lab coat) and shoes at all times (no bare toes, torso, etc.)
  - Perform all operations in a fume hood; watch your material through the hood window
- Keep your distance
  - Keep your face at least 2 feet from materials and apparatus
  - Never hold an apparatus or compound over your face/head
  - Never point the opening in a flask or test tube at someone else
- Avoid dangerous operations when possible. Discuss with your colleagues and let all nearby people know before/when performing any dangerous operation that cannot be avoided.

Protecting the outside world. Protect the outside world by disposing all materials properly, in chemical waste containers (to be picked up by EHS). Also avoid lab operations that pollute the environment. Never pour waste chemicals down the drain!

3. The following safety rules MUST be followed (this is not an exhaustive list)

a. Eating, drinking, smoking, and chewing tobacco are all prohibited. Use the proper area to eat, SR 387.
b. Any injury or accident is to be reported to the lab supervisor as soon as possible.
c. Safety glasses are required at all times.
d. Long pants are required.
e. No open-toe shoes are allowed. Leather shoes are recommended.
f. Always use the hood for organic solvents, volatile chemicals, concentrated acids, and volatile hazardous chemicals.
g. Use gloves when handling hazardous chemicals. No laboratory gloves are to be taken into non-lab areas.
h. Always use gloves, eye, and ear protection when necessary.
i. Transport chemicals within the department using a proper cart, or a safety carrier
j. Work in pairs when warranted, especially after normal work hours and if carrying out hazardous procedures.
k. Be familiar with the equipment before using it. Do not operate equipment you do not know how to use. Treat all equipment gently. Do not yank or pull things by cords or electrical leads.
l. Laboratory microwaves, refrigerators, and freezers should never be used for food.
m. Clean up space and lab equipment ASAP after use. Clean up all spills, droppings, or broken items.

4. Safety Data Sheets

The student is required to read Safety Data Sheets for any hazardous chemical that they would be using in the lab to understand any hazardous risk and know how to safely handle. Access to Safety Data Sheets and information on chemicals can be found on the Chemwatch Database (https://www.csuohio.edu/ehs/access-database)

5. Laboratory Specific Safety Guidelines

The student must meet with faculty or staff member in charge of a particular lab to become informed on safety precautions for any chemical, process or procedure that is specific for that laboratory.

6. Mandatory Training

The Department of Chemistry requires faculty, staff and students to receive specific training before working in the following areas:

a. Bloodborne Pathogens
b. Compressed Gas
c. Electrical Safety
d. Laser Safety
e. Chemical Handling, The Basics

These videos are available for your personal viewing by signing them out from Tony Carter in the COSHP Dean's Office, SR 353. (Make sure that you and Tony document the date and time that you viewed each video).

7. Radiation Training

Radiation training is required by the Office of Environmental Health and Safety for those working with radioactive chemicals. Procedures and forms for radiation handling are found on the website https://www.csuohio.edu/ehs/radiation-safety

The procedure to follow before working with radiation is:

- If you are a student, you have to go through the lab training class conducted by Dr. Komar @ 687-2516.
- If you are a Professor, you have to submit your experiment outline with resume of past experience and then meet before the Radiation Safety Committee. Contact Robert Howerton @ 687-3715.
- The Committee will then vote on the applicant's submittal.

8. Lab Safety Inspections (applies to Cleveland State labs)

Lab inspections carried out by the Office of Environmental Health and Safety will cover the following areas and so these areas must be kept up with on a continual basis:

a. Proper separation of chemicals;
b. General cleanliness of refrigerators, freezers, hoods and sinks;
c. General cleanliness of labs and glassware;
d. Clear aisles;
e. Broken glass disposal;
f. Bio-hazardous and hazardous waste disposal;
g. Containers that are not labeled;
h. Improper storage of chemicals;
i. Open mercury containers;
j. Proper gas cylinder holders;
k. The maintenance of electrical equipment;
l. The eyewash stations, fire extinguishers and emergency showers will be inspected by the physical plant.
m. There cannot be any food containers or wrappers in any of the waste baskets in the lab.

A "Lab-self—inspection-checklist" prepared by the Office of Environmental Health and Safety is

found at https://www.csuohio.edu/ehs/research-safety

9. Emergency Safety Points to Remember*:*

a. Be aware of the fire exits that you are to use in exiting the building from your lab.
b. Use only stairwells during emergencies.
c. No employee shall reenter the building after leaving in an emergency until given the all-clear to return.

10. Incident Reporting and Action Procedures

10.1 Minor Lab Spills (However if hazardous, treat as an emergency given in point 9.2 below)

- Keep students/others away from any chemical spill
- Contact the faculty or staff member who is in charge of the lab
- Clean up non-emergency spills using standard procedures and equipment (See Appendix B for location and list of spill equipment)
- The Office of Environmental Health and Safety wants the University community to report all chemical spills or any leaks that potentially may impact the environment immediately. Please follow the Emergency procedures established for such incidences. Do not leave a message reporting a spill or leak on voicemail! If you need immediate response by OEHS, contact the Campus Safety Dispatch by Dialing 9-1-1, or 8-9-1-1 from any campus telephone. Cell phone users can also dial 9-1-1 and ask the operator to contact CSU Police.

10.2 Emergencies (Fire, Explosion, Medical, Hazardous Spills)

Any person that discovers a situation such as a fire, explosion, and accidental release of hazardous material into the air, soil, surface water or sanitary sewers of affected buildings should immediately initiate these actions:

- Activate nearest FIRE ALARM & LEAVE THE AREA
- Contact CSU Police (University Phone 9-1-1) from a safe distance. Cell Phone Users also may dial 9-1-1 and tell operator to connect you with CSU Police.
  Give Dispatcher a complete description of the incident:
  - Provide your name, telephone number, and location.
  - Identify the building where the accident occurred using room number or location of the accident.
  - Describe the type of accident: fire, explosion, spill, leaking drum and/or container etc.
  - Note any markings or identifying labels on the drum.
  - Note the need of medical assistance for any injuries or chemical exposure.
- Await the arrival of CSU Police to reinforce and provide additional information, which may have previously changed from the initial call.
- Ensure all persons are kept as far away from the area as possible. No re-entry is permitted unless authorized by CSU Police.
- Take immediate action if possible to control and contain the emergency. Emergency spill equipment is located in various areas of the University. See Appendix B for a list of locations and types of spill equipment available.
- The Chair of the Department of Chemistry and the faculty/staff member in charge of the lab should also be notified as soon as possible.

10.3 Incidents resulting in an injury or near-injury

The procedure for taking care of an injury/accident (whether happening to the graduate student them self or, as a teaching assistant, for a student injury in the laboratory that the teaching assistant supervises) is given on the following website. https://www.csuohio.edu/ehs/report-occupational-injuryillness
The priority is the care of the student, however the faculty/staff member in charge of the lab, as well as the Chair of the Department of Chemistry should be notified as soon as possible. A report must be filed within 24 hours of the incident (the form given on the following website): https://www.csuohio.edu/ehs/report-occupational-injuryillness

10.4 Incidents resulting in damage to facilities or to instrumentation

Report any damage to the faculty/staff member in charge of the lab

11. Emergency contact information

Campus emergency – 2111, Campus police – 2020

Week Days:
Health services Tel. 3649 (minor first aid)
Chemical spills Tel.2500 (then the Department Chair)
Water leaking Tel.2500 (then the Department Chair)
Nights/weekends:
Campus police Tel.2020
Lab supervisor: Research Advisor's phone number (if research lab) _____
or Instructor's phone number (if teaching lab) _____
(The graduate student is responsible for obtaining and recording these numbers)

B. Environmental Regulations

1. Chemical Disposal

(Procedure for Cleveland State, if working in external institution follow their guidelines)The management of hazardous waste is regulated at the federal level by the United States Environmental Protection Agency (EPA) under the authority of the Resource Conservation and Recovery Act (RCRA). In accordance with these regulations, "the indiscriminate drain-disposal of chemicals/materials" is prohibited.

1.1 No chemicals or solutions are to be disposed down the sink or in the waste basket but are to be disposed in containers that labeled as to the identity of the chemicals or solutions.

1.2 Exceptions

- Acids free of all other hazardous waste properties may be disposed of in sinks leading to acid neutralization tanks. Sinks with such features are located in the Basic Science and Science Research Buildings. No other sinks may be used. Residues (e.g. sludge) from both acid and base neutralization are to be evaluated when removed from tanks and sinks used for neutralization.
- Bases free of all other hazardous waste properties can be neutralized using a weak (1.0 Normal) hydrochloric acid solution. Residual material resulting from this process will be evaluated for hazardous waste properties. Following verification of acidity (litmus or other appropriate method) the solution may then be disposed of in a sink fitted with acid neutralization capabilities.
- Any other exception for a particular chemical or solution must be approved by the Office of Environmental Health and Safety (extension 3715).

1.3 Pickup of chemical waste by the Office of Environmental Health and Safety

All hazardous materials (container labeled as to content) is disposed of by contacting EHS (extension 3715) for pickup. A *Hazardous Waste Inventory* form is required to be filled out prior to the pickup. https://www.csuohio.edu/sites/default/files/hazardous_waste_inventory.pdf

1.4 RCRA Metals: The elements arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag) are of particular concern according to RCRA, with low maximum allowable levels permitted in many forms of waste. Waste containing significant quantities of these elements or their compounds is more expensive to dispose of. When working with materials containing any of these elements, it is best to have a "RCRA metals specific" waste container, so that the main waste containers are not contaminated with these elements and do not require more expensive disposal.

2. Proper Chemical Storage

Students are required to read and know the information in the document *Practices for Proper Chemical Storage* which is posted on the CSU Environment Health and Safety website (https://www.csuohio.edu/ehs/laboratory-safety-0).

3. Infectious Waste Handling and Disposal

Students handling infectious or potentially infectious (such as blood, serum, plasma) samples are to follow the procedures given in the *Infectious Waste Contingency Plan* pdf
given on the website https://www.csuohio.edu/ehs/environmental-compliance-0

4. Miscellaneous

No dry ice in the sinks (dry ice cracks the sinks and drains). Let it evaporate in the ice bucket after use.

VI. Laboratory Practice

A. General Laboratory Practice Principles

- Clean your work area (bench, fume hood) at the end of every lab session
- Clean up messes you make in communal work areas: reagent fume hood, balance, cold room, etc.
- Dispose of all trash (excess chemicals, used pipettes, used gloves, etc.) at the end of every lab session. Remember to put cardboard boxes outside of the door, they will be collected by designated personnel.
- Dispose of liquid and solid waste to specific containers and keep the caps closed at all times. Remember to fill out the *Hazardous Waste Inventory* form (https://www.csuohio.edu/sites/default/files/hazardous_waste_inventory.pdf) and request removal of the waste when needed.
- Do not use any equipment with which you are not quite totally familiar, or do not know how it works.
- Protect communal reagents
  - Do not put anything into a reagent bottle except a clean pipette/spatula or drying agents
  - Do not return contaminated reagent to the reagent bottle
  - Cap bottles as soon as possible
  - Return reagents to their original locations ASAP
- Label (content and date) and properly store all chemicals you make
  - Dispose of chemicals when they are not useful, including those in the freezer and refrigerator
  - Store volatile liquids in a fume hood in a tightly capped container
  - Do not cap a hot liquid until it has cooled to room temperature
- Update your chemical lists ASAP
- Before you order any new chemical, check to see that it is not in the lab, and consult with your research advisor if it is unusual, hazardous, or expensive.
- Keep the balance clean at all times
  - Use clean weighing paper (or weighing boat, flask, vial, etc)
  - Do not return contaminated compounds to reagent bottle
  - Clean up spills around the balance

B. Policy and Practical Guidelines of Laboratory Notebook Recording

1. Overview

A laboratory notebook is an important tool that goes well beyond research management and can have important implications for issues ranging from intellectual property management to the prevention of fraud.

- Although you may think you will remember what you did and why you did a certain experiment in a week's time, YOU WILL NOT! Therefore, there is a need of laboratory notebook to record all of what you did.

- The laboratory notebook should be a court-ready documentation, a bound laboratory notebook. It must be:
  - an honest representation of the research work done by the researcher
  - regularly written (daily recording is normally recommended)
  - routinely witnessed (weekly/monthly) by another scientist/supervisor
  - archived in a secure place and/or by a secure method.
- Remember, laboratory notebooks and their contents are ***confidential*** and of great value. Prevent damage. Store them in safe places and report any loss or theft to your supervisor immediately. When you leave your laboratory for any length of time, inform your supervisor of the whereabouts of your laboratory notebooks. When you leave the institution permanently, ensure that your notebooks are handed over to your supervisor.
- Remember, another scientist might have to take up where you left off. Although your supervisor will have your lab notebook, your successor will also need to have a copy to help her or him continue your work. It will be essential that your results can be repeated.

2. What is a Laboratory Notebook?

A laboratory notebook is:

- a daily record of every experiment you do, think of doing, or plan to do
- a daily record of your thoughts about each experiment and the results thereof
- the basis of every paper and thesis/dissertation you write
- the record used by patent offices (in the event patents are filed on your findings) and, in the case of disputes, courts of law
- a record that would enable successive scientists, working on the same project, to pick up where you left off or reproduce your results

3. What Goes into a Laboratory Notebook?

On the front cover of the notebook should be a description of what is contained in it. The first and last dates of entry should also be written on the front cover. Then,

- A detailed account of every planned and executed experiment with the amount of detail that would enable a scientist *skilled in the art* to determine what had been done, why it had been done, and what the results were
- Dates accompanying every entry, account, or record
- Protocols, reagents, lot numbers in each entry, and where appropriate, sketches, descriptions, and so on
- Explanations of the significance of each experiment, as well as the observations, results and conclusions of the experiment
- Details of each experiment (remember, what may seem trivial or obvious at the time your experiment was conducted, may later be of critical importance.)
- Do not make sweeping statements, such as, "*This procedure is worthless*" or "*We infringe X's patent with this procedure*." Statements like this could affect the future patentability of your research.
- Photographs, computer generated data, and so forth should all be attached in your notebook in such a way that they will not come loose. If the format of these data is too large for your laboratory notebook, sign and date such data and file them in a loose-leaf ring file that can clearly be identified. Record the location of these documents in your notebook

- Cross-references (If you have already described an experiment earlier, or if you have used a standard protocol and have not deviated from the previous descriptions of the experiment for your current one, you may reference the earlier information instead of writing it out again. For example, if you are starting a new experiment on page 48 and are using the same protocol as already described on page 22, write on page 48, "*following the protocol as described on page 22 of this laboratory notebook*.")
- Using preprinted forms can save time, if your experiments involve common, standard procedures.
- Information with regard to any data that has been electronically captured (These data should be accessible to any scientist *skilled in the art*. Such electronic data should be backed-up and archived weekly).
- If experimental data were collected by somebody else (e.g. a collaborator), but you are going to use it to make figures and tables for your manuscripts and thesis/dissertation, you need to obtain copy of the data, properly store it, and make it accessible to any scientist *skilled in the art*.
- Corrections must be made by drawing a single line through the entry. If you leave more than four lines at the bottom of a page, cross through the area to indicate that those lines were unused. Never use whiteout or completely efface a mistake with ink.

5. Checklist

- Keep up with the table of contents
- Date each page
- Number each page consecutively
- Use continuation notes when necessary
- Properly void all blank pages or portions of pages (front and back)
- Enter all information directly into the notebook
- Properly introduce and summarize each experiment
- Include complete details of all first-time procedures
- Include calculations
- Include notes/observations of unexpected outcomes

6. Who Owns the Notebook

The person or organization who pays the bills owns your laboratory notebook. In most cases this will be the company, university, or research institute who employs you or your supervisor.

C. Retention and Backup of Data

1. It is essential for the student to retain all data generated from experiments, including:
   a. the primary data from experiments and instruments files (including data collected by somebody else and used to prepare figures and tables for manuscripts and thesis/dissertation)
   b. processed data, including data used to make figures and tables for manuscripts submitted for publication and contained in the thesis or dissertation (processed excel files or files generated by software used in analyses).
   c. It is advisable that the the student puts together primary data folders containing all primary and intermediary data, together with explanatory step-by-step notes of how the data were used/processed to create each figure and table in the manuscripts and thesis/dissertation. Many

journals and extramural funding agencies are increasingly demanding the deposition of primary data before manuscripts are accepted for publication. In addition, the journals and extramural funding agencies might initiate audit procedures to confirm the published research many years after the student graduates, thus it is essential that the student provides all details about the research so it can stand up an external audit.

All these data must be accessible to the dissertation committee at any time.

2. Back up data daily, otherwise valuable data will be lost. Research that cannot be confirmed by primary data cannot be published and a thesis/dissertation based on those data cannot be defended.
3. Name files according to specifications given by the Research Advisor.
4. Ask your Research Advisor early on if you have questions about the retention and backup of your research data or if there are challenges/obstacles in doing it.

D. Instrumentation

1. If equipment breaks, tell the staff member or faculty member in charge. Under no circumstances is anyone to leave an instrument in non-working condition without dealing with it.
2. Always turn off equipment when finished (e.g. the microscope, spectrophotometer and pH meter), unless proper protocol requires that the equipment be left on continuously (e.g. freezers, gloveboxes, some vacuum pumps).

E. Practice in Specific Laboratories

The student should request from the faculty member or staff member in charge of the lab guidelines for instrumentation and procedures specific for a particular laboratory.

F. Ordering Supplies and Chemicals (Cleveland State)

1. Find out from the Research Advisor how ordering is to be done. The Research Advisor may want to place the orders or have graduate students place orders. If the latter, approval for the purchase and the account number needs to be obtained from the Research Advisor before placing the order. The order is placed on MagnusMart. Instructions for placing an order on MagnusMart are given on the website https://www.csuohio.edu/sites/default/files/CSU_Requester_Instructions.pdf

2. A *Chemical Procurement* form (https://www.csuohio.edu/ehs/laboratory-safety-0) must be filled out and then submitted as an attachment in MagnusMart. Radioactive materials (addressed in the University's Radiation Safety Program), amino acids, biological agents and buffer solutions, biological growth media, proteins, nucleic acids, digestible sugars (-ose) and non-digestible sugars (-ol), tissue culture supplies, various non-toxic salts, and general consumer products (those that do not require an SDS) are excluded from this procedure.

3. Upon receipt of any chemicals, the chemical (with amount) should be entered on chemical inventory list of the laboratory. A *Chemical Inventory Template* spreadsheet is posted on the website https://www.csuohio.edu/ehs/chemical-security-programs

VI. Travel to Conferences to Present Research

Instructions to follow and paperwork to file for reimbursement for all conference expenses (registration, travel to and from, and expenses while at the conference) for students presenting research (poster or oral) at a conference are found on the College website (https://sciences.csuohio.edu/student-travel?). Students should seek financial support from all sources, including: the research advisor, the Department of Chemistry, the College of Sciences and Health Professions and the College of Graduate Studies. Those students who study in the Cellular and Molecular Medicine Specialization can also apply for travel funds from that program (https://sciences.csuohio.edu/cmms/cmms-travel-funds). All forms should first be submitted to the department for account numbers, signatures and other pertinent information.

Appendix A

Teaching Assistant Handbook

Department of Chemistry
Cleveland State University

Joshua Whited

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Preface

Welcome to the Chemistry Department at Cleveland State University. One of the goals of our graduate program is to produce exceptional teachers as well as excellent researchers, and this handbook was designed to aid in achieving that goal. It will provide you with important policy information along with outlining semester and day-to-day procedures. It should also serve as a guide to experienced teaching assistants to ensure classes are taught in a uniform manner and to ensure teachers a working to their full potential.

This guide is will familiarize you with your teaching responsibilities within the chemistry department, particularly undergraduate chemistry, and provide you with specific information needed to fulfill those duties.

Teaching Assistants have a great opportunity and responsibility within the department. A large portion of an individual's instruction and experience with chemistry comes from the example set forth by the Teaching Assistant. Knowledge, dedication, and motivation are all exemplary traits respected by the students and go a long way concerning their performance. You will be a direct influence affecting the students' attitude toward the department, college, and university and may influence their future career choices.

If you desire a career in teaching or research, the ability to effectively communicate your scientific work with other professionals and the public will be vital to your success. In addition, a good attitude and sound ethics will support quality teaching and your view of these will serve to determine the effectiveness of your teaching. Therefore, the role of a Teaching Assistant is not only a benefit for others, but will significantly affect your personal and professional development as well.

We hope you will enjoy teaching in the Department of Chemistry and find this handbook useful. It is our job to help you have a rewarding and gratifying experience as both a Teaching Assistant and graduate student. Good luck!

Dr. Jerry Mundell
Freshman Laboratory Manger

Dr. Michael Kalafatis
Department Chair

I. Introduction

A. Responsibilities

As a Teaching Assistant (TA) for the Department of Chemistry at Cleveland State University, you will have the following responsibilities.

1. **Attend weekly TA meetings**
   These meetings are mandatory. The Lab Director will provide important information regarding upcoming labs and you will have the opportunity to discuss any problems that have arisen.

2. **Run two lab sections each week**
   a. Arrive at the lab 20-30 minutes before class is scheduled to start to ensure everything is ready for the students when they arrive;
   b. Supervise lab until last student is finished;
   c. Ensure the lab is left CLEAN and ORDERLY with common equipment returned to where it belongs and instrumentation turned off;
   d. Secure the laboratory when you leave.

3. **Grade assignments for your labs**
   This includes prelab quizzes, laboratory notebooks, lab reports, and exams. The turn around time for grades will be one week from the time the assignment was collected. All grades are to be maintained in the blackboard database.

4. **Proctoring/Tutoring**
   These duties will be determined on a per semester basis as defined by the Lab Director.

B. Goals

Our goal for teaching in the Chemistry Department is to ensure students gain a strong foundation of chemical knowledge through application of concepts, logical problem solving, and visual representation, both in the laboratory and in written work.

TAs have a great opportunity and responsibility within the department. A large portion of an individual's instruction and experience with chemistry comes from the example set forth by the Teaching Assistant. Knowledge, dedication, and motivation are all exemplary traits respected by the students and go a long way concerning their performance. You have the closest contact with students and will most directly influence their attitude toward the department and their performance in their courses. It is vital you take this responsibility seriously; you will be the face of the chemistry department to your students.

This handbook is intended to familiarize new members of the Chemistry Department with their responsibilities, provide specific information about the performance of their duties, and act as a touchstone for more experienced TAs to ensure they are teaching to the utmost of their ability.

II. General Information

A. Schedule

Your teaching assignment will be given to you before classes start each semester. It will be adjusted as much as possible not to interfere with your own classes or schedule. It is your responsibility to communicate any schedule conflicts to the Lab Director prior to the start of the semester.

B. Grading

A grading scheme for each lab report will be provided on Blackboard for you to follow when correcting students' work. It is important that the point distribution is carefully followed. Deviations from the grading schemes lead to significant variations in scores.

No matter how detailed a grading scheme, it cannot predict every type of answer you will run across. The best way to grade assignments is to look at a few before assigning points. This way you will have a feel for how to distribute partial credit before marking up your students' papers.

Each TA will maintain their class grades on Blackboard. This not only ensures grades are safely maintained but also allows students to view the grades and bring any questions up to the TA avoiding any complications at the end of the semester. Your grades must be kept up to date and should be posted no later than one week following the submission of the report by the student. The students learn from the mistakes they make and the sooner they see their graded work, the sooner they stop making the same mistakes. In addition, midterm and final grades must be submitted as directed by the Lab Director.

Under federal law (FERPA), you cannot disclose a student's grade to a person other than the student or the instructor(s). This pertains to handing back assignments so that scores are not visible to others.

C. Guidelines for Proctoring

1. **Passing out the exams**
   Before you pass out the exams, make sure all books and notes are put away. Count the number of students in a row and pass out only that number of exams. Do not just give them a stack of exams; this is how exams go missing. Once all of the exams have been passed out, let the class know, and they all start at the same time. At this point, count the number of students and the number of extra exams and that should be the same number of exams with which you started. If there is an exam missing, walk around and see if it can be found. If needed, make an announcement. The reason for this is students have put blank exams in the bathroom or another classroom and filled in the blanks while out to the bathroom. The exams are also passed down from student to student. Keep in mind, *professors are extended the authority to change these guidelines as they see fit*.

2. **During the exam**
   Do not bring your computer. Your job is to watch the students, not to bury your attention into your computer. Walk around, there is usually a reason why some students sit in the back. If you suspect a student of cheating, you have every right to let that student know. Do not accuse them of cheating, but telling them to keep their eyes on their exam will give the message. If there is any physical evidence of cheating (cheat sheets, writing on their hands, cell phone pictures, etc.), confiscate it. Also, obtain the name of the student and alert the Lab Director and Professor.

3. **Collecting the exams**
   When the time is up for the exams, let the students know and be proactive about collecting the exams. Some students will only stop taking the test when you take the exam from them. Students have been known to discuss questions and change answers on the way to turning in the exam. Before you leave the room, count the exams again to make sure no one has taken an exam home. Most professors require you to check student identification prior to accepting the exam from a student.
   These guidelines are meant to give equity to all students so some do not have more of an advantage than others, unfortunately, every year there is at least one incident to remind us that some students do commit academic dishonesty.

D. Teaching

Each week you will have average approximately 8 hours of contact time with your students as outlined in the responsibilities section of the introduction. Lab is a hands-on exercise, and it is imperative that students receive excellent instruction to learn the proper application of theories covered in the class.

Tutoring is designed for one-on-one instruction with students in your section as well as students in other chemistry courses. This time is to review concepts for individual students deemed inappropriate for prelab discussions. Inappropriate may be defined as time constraints or questions more suited for individual attention such as grading.

E. Evaluations

Students evaluate TAs at the end of each semester. Standard questionnaires are used and are given out at the end of each semester. The faculty will be presented every semester with a full teaching evaluation for every TA. If your performance is determined to be unsatisfactory, a meeting may be scheduled to determine future employment and salary. As it currently stands, the current policy is a written notification of "failure to perform" for the first infraction. The second infraction will involve the termination of your contract and you will no longer be a TA.

At the end of the academic year, departmental and college-wide teaching prizes are given to those TAs who have made the greatest positive impact on their students. Nominations for these prizes are weighed most heavily when submitted by students.

III. Attitude and Ethics

A. Attitude

Your attitude towards teaching will be reflected in your students' attitude towards the class. In the classroom, your carefully thought-out and clearly expressed instructions will cause a similar and reciprocal behavior from your students. Remember your attitude towards the class and teaching materials will rub off on your students. If you demonstrate that your opinion about lecture is that it is a waste of time, your students will act in the same way. You are in a professional role as a TA and your attitude must show this.

An extremely valuable attribute of a good teacher is enthusiasm in presenting the discipline, which is second only to having a thorough grasp of the subject matter. If you demonstrate knowledge about the material and pleasure in teaching, they will respect you as a teacher and chemist even though chemistry may not be their main interest.

B. Ethics

If you respect your students, and are not condescending while discussing work or performance, they will show you the same respect. However, if you are arrogant or patronize their work, they will feel uncomfortable and communicate with you as little as possible. At all times, you must remember you are a TA and not one of their peers. At no time should you become part of their personal lives. You are an academic professional and must maintain a professional relationship ***only,*** with all of your students. Social media as well, is considered off limits between TAs and students. It is the long-standing policy of the University to forbid dating students in your classes. This policy will be strictly enforced.

Punctual attendance to all tutoring, lab sessions, proctoring, and meetings is expected. Your students will look up to you as one who sets and maintains academic and social standards. On the same token, students must know that they are also expected to be on time and class will start with or without them. If you are unable to make it to any of the above responsibilities, arrangements must be made with another TA to take your place. For example, if you know you will be late to the lab, you can arrange for another TA to teach the class for you until you arrive. Consistent tardiness and absenteeism will diminish not only your students' opinion of you but your colleagues and faculty as well. This could have a large impact on your contract as a TA. Absence from any scheduled session is inexcusable unless you have made prior arrangements for someone to take your place. You are required to let the Lab Director know of the difficulty as soon as possible.

Impartiality is sometimes a difficult yet required part of being a TA. You may think you are helping your students by giving them a break, but it opens the door for other students in the department to expect the same treatment. Your relaxation of the rules makes it difficult for the other TAs to ensure all students are treated the same. This also sets a precedent for the students to ask for extensions and exceptions.

Be sure you clearly and fully understand the material you are to deal with and how you are to handle it in the laboratory and discussions, so each experiment will be carried out properly and with the expected results. There is nothing more demoralizing to a student than to be told to follow one procedure and then get quite different instructions while conducting the lab. If possible, any changes to be made to lab procedures should be given to the students one week in advance so they can prepare for the lab properly.

If you find a situation you think needs correcting, tell the Lab Director so it can be corrected. We are all integral to the success of the CSU undergraduate labs, and everyone must be treated with respect. Treat the Lab Director and Preparation personnel with respect; they are on the team too. Do not complain to the students about the course material; bring the issue to the Lab Director for resolution.

You are part of the teaching staff, not a student (in this course). Be sensitive and sympathetic toward the students, but do not try to be "one of the gang." You need to keep some separation between yourself and the students to maintain your objectivity and authority. On the other hand, do not abuse your authority. You can be firm and maintain high standards without being dictatorial, egotistical, and unfair.

IV. Laboratory

A. Laboratory check-in procedure (Day 1)

For the first day of class, a review of items on blackboard and all safety procedures must be discussed.

1. **Attendance**

   Students should check-in with you, the TA, first. Remember to TAKE ATTENDANCE! You will be given a roster of student names and ID numbers, if not, these can be found on blackboard. Students listed under the users section as "visible" are the students that are supposed to be in your lab. Watch for stragglers. If a student is not on your roster, they should not be in your lab. Determine the correct lab and direct them to the lab manager if necessary. Never give permission for a student to join your section. They can change courses using CampusNet or if this does not work, they can speak with the Lab Director. If you have not done so already, introduce yourself and, after that, you can start the safety training.

2. **Safety training**

   Each student must be given a copy of the safety agreement provided in the appendix of this guide. You read this, to the students line by line and all questions must be answered. Only after all questions are answered, the students must sign the form and hand back to the TA and the TA will keep these forms until the end of the semester. The students are to watch a safety video provided to them on Blackboard. The students will watch this video on their own outside of the lab. Tell the students that the next lab, a safety quiz will be conducted based on this video. In addition to the safety agreement and safety video, you need to identify all fire extinguishers, showers, and eye wash stations.

3. **Following weeks agenda**
   It will be of benefit to you if you provide an agenda and list of materials needed for the following week. These include; watching the safety video, buying a carbonless copy notebook, safety goggles, and preparing their first prelab. For the prelab it only need be explained as an outline of the procedure stressing the fact this is should only be a summary and not direct word for word copy. Address any questions as necessary.

B. Supervision

1. **Arrive early**

TAs must report at least 15 minutes before the beginning of the lab in order to determine preparedness for the lab concerning chemicals and instrumentation.

2. **Goggles**
THE TA AND STUDENTS MUST WEAR SAFETY GOGGLES in the lab AT ALL TIMES, while an experiment is in progress. The students will follow the lead of the TA, so when you wear your goggles they will wear theirs. Safety goggles are mandated not only by the University Safety Office, but also by Ohio State Law. Only goggles approved by the Safety Department and/or the Chemistry Department are allowed in lab. Students may be allowed to return home to retrieve their goggles if time permits. If the student will miss most of the lab, they should attend another lab session during the week.

3. **Walk around lab**

Once class routines are established, you are likely to find your time fairly well taken up in answering questions. Do not remain at the instructor's desk. It is important to observe the students in their actual performance of laboratory work. Effective teaching in the laboratory requires continuous contact with the students and their work. Make a definite effort to visit every student at least once during each laboratory period. In order to foster independent thinking, you could ask questions about the lab in order to determine their level of understanding. Once they know you will ask them questions, they will spend more time learning the theory and applications relative to the lab experiments. Other activities beyond lab teaching will not be allowed in lab, e.g. using computers, grading students' homework and lab reports, reading research papers, etc.

4. **Be an active teacher**

Watch regularly for opportunities to give help in developing good laboratory techniques and safety – for example, the need to keep the front sashes of the fume hoods at the appropriate levels or the need to keep corrosive chemicals away from balances and other special apparatus. Occasionally, go from one student to another to ask questions concerning the experiments, for example ask what the student is doing, why they are doing it, and what they expect to happen.

C. Daily Activities

1. **Notebook Signatures**

It is a requirement for TAs to ask for the students' written record of data and observations as recorded in their lab notebook. **Students' lab notes are written directly into their notebooks in ink** and the TA needs to make sure the students record their own observations. The TA will initial the completed handwritten data sheet of their students' notebook pages every week at the end of each lab. If time permits; the TA may occasionally ask questions about the experiment or discuss the quality of the students' work. This time can be used to explain such things as strikethroughs are used instead of scribbling or using white out. Such procedures can help to discourage hurrying through the performance of the experiments in order to leave the laboratory early.

2. **Student Responsibility**

The TA is responsible for all of the students in the room. Do not allow a student from another section to work in your laboratory, unless a signed **LAB VISITOR FORM** from the Lab Director is provided. The TA, as well as the students, should be in the laboratory throughout the period. Students are not to leave the laboratory before they finish the experiment without permission from

the TA, nor to wander around and visit.

3. **Waste**

The proper disposal of waste chemicals is an important moral and legal obligation of the Department. In each laboratory, a waste container will be marked with your course number on it. You should dispose of your chemicals in this container only, unless otherwise directed. If there are any questions about this you can speak to the lab preparatory personnel and the course instructor.

4. **Lab Clean-up**

Keeping the laboratory clean is an important part of the TA duties. The students perform most of the cleaning throughout the semester – you should make your students aware of this fact. One effective way of encouraging cleanliness is to make sure each student has cleaned and wiped down his/her bench top area before you initial his/her lab notebook. The student is responsible for cleaning up after a spill to the best of his/her ability with guidance from the TA. In the event of a major spill, the TA will assist the student in cleaning it up and informing the Lab Director. You should be especially certain that balances and other common areas are kept clean and free of debris. **EACH TA IS RESPONSIBLE THAT HIS/HER LABORATORY ROOM IS READY FOR THE NEXT CLASS CONCERNING CLEANLINESS.** In addition, the TA must check for open water, gas, nitrogen, vacuum, and air outlets before leaving. All balances and instruments must be off, and the instrument room secured.

D. Grading

1. **Assignments**

a. Prelab Quiz – A 5 question quiz will be given to the students before they perform the experiment. They may not use any notes during the quiz. Questions and question type may vary based on TA. This quiz will determine their preparation and understanding of the lab to be performed that same day.

b. ***Carbonless Copy*** Notebook – The TA must check and initial every student's lab notebook at the beginning and end of each lab. At the beginning of the lab, before the quiz, the notebook must be initialed immediately following the last word of the prelab assignment, indicating completion of the prelab assignment. At the end of each lab, the notebook must be initialed again, immediately following the data, as an indication that all lab data has been obtained, and the students have done their part in cleaning up their bench-top. At the beginning of the next lab, the student will turn in their carbonless copies of their notebook pages as part of their lab report.

c. Lab reports are due one week after the completion of an experiment. Students will hand in their lab reports when walking into the lab. Lab reports are considered late if they are handed in any time after the beginning of the lecture portion of the lab. The late penalty is 10 points per day. Any lab over one week late will receive a score of zero.

Lab Report – There are four main parts to the lab report. (Examples are on Blackboard)

1.) Introduction/background: Consisting of essential vocabulary, theory, applications, and any additional information.
2.) Prelab: outline of procedure written in notebook or typed.
3.) Data/Calculation: Handwritten in lab notebook, only one calculation of each type needs to be shown. The data sheet cannot be the one provided in the lab manual, it must be copied into the carbonless copy notebook.
4.) Results/discussion: The result section reiterates any pertinent information that is to be drawn from the data and calculation section. For example, what are the final values you obtained from your calculations? The discussion is the section that explains why those results are

important. In addition, students could explain if the lab objective was met, experiment performed successfully and how it could be improved upon next time.

Clearly mark on lab reports/notebook pages why points were deducted. This is how the students will know what mistakes not to repeat. Refrain from writing unnecessary comments on student's work.

E. Recitation

1. **Be prepared**

Not even the most experienced and best teachers try to teach without preparation. Do the assigned problems. A problem may look simple and straightforward but there are few moments more embarrassing than being unable to do an assigned problem when you are standing in front of a class.

2. **Think about your appearance**

Dress as if you care about the discussion section and have prepared for it. You must adhere to all guidelines the students are expected to follow such as; no open toe shoes (including flats), no shorts, or short dresses, etc. Remember, all eyes will be on you.

3**. Handling a discussion**

a. **Learn your students' names**

Call on the student by name. They need to feel personally involved in the learning process.

b. **Speak clearly and loudly**

Make sure your voice is loud enough so that all of the students can hear you clearly. Face your students instead of talking to the board.

c. **Use PowerPoint / dry erase / chalkboard**

Be sure to write legibly on the board and make sure your writing can be read from the back of the room. Do not erase something before your students have copied it down. Be careful not to stand in front of your writing so all can see it.

If the room is equipped with audio-visual equipment, PowerPoint presentations and video are also an option. This can benefit students by providing detailed real-life examples of instruments and applications. This information can be uploaded to Blackboard for students, assisting them in their completion of the lab reports during the week. It is recommended to work through problem examples on the board with the students rather than presentation alone.

The use of PowerPoint and/or the dry erase board is left to the sole discretion of the TA.

A general guideline about the recitation is to spend 5-10 minutes on the theory demonstrated, 5-10 minutes on important procedural steps and calculations, and 5 minutes on safety precautions and student questions.

d. **Encourage participation in the lecture**

The discussion provides an opportunity for just that – discussion. Encourage all students to participate by calling on them by name. Do not let one or two students dominate every discussion. When you ask for questions, do so in a way that makes the students feel you really welcome

questions. By referring to specific material where you know problems are occurring, you can get more response than by just asking, "Does anyone have questions?" After you have answered a question, ask the student if you have answered their question or if something is still unclear. You can also ask questions of the students in order to keep them attentive and involved.

e. **Be open and honest**

When a question arises for which you do not know the answer say, "That's a great question, let me look into it and I will get back to you," and find the answer before the next meeting. Do not try to bluff. You will look bad, and worse, the students will get incorrect information.

f. **Other teaching strategies**

In your discussion, be very clear about what you are presenting. Writing key points of the discussion on the board and carefully detailing parts of the discussion will keep the students on track. Summarize main discussion points and ask for questions before moving onto the next topic. If you choose to use PowerPoint, be sure to print out the presentation so that each student can follow along with your lecture. Verbal teaching requires organization, simplicity, and repetition. Do not be afraid to be simple and direct. Your students have heard chemistry is hard and they want to know what will help them succeed. It is your responsibility to help them with this.

V. Conclusion

This guide has covered the teaching policies, job responsibilities, job requirements, and general concerns for the Chemistry Department at CSU. It will continue to serve as a useful tool during your time as a TA. Your position as part of the teaching staff is a very important and prominent role as viewed by the other members of the university.

With the importance of your role stated above, communication is the key to fulfilling your job. Therefore, you should direct any questions or concerns to your Lab Director or other TAs, since we are here to help you perform your job. Teaching can be extremely exciting, enjoyable, and rewarding. It is the Department's hope that you will achieve these goals while a TA in the Chemistry Department.

Appendix B

Department of Chemistry
2398 Euclid Avenue, Cleveland, Ohio 44115

Laboratory Safety Agreement

1. I agree to not work alone in the lab.

2. I agree not to perform any experiments which have not been authorized.

3. I agree to wear a lab coat and safety goggles at all times in the lab **(NO CONTACT LENSES!).**

4. I agree to wear gloves when manipulating chemicals. I will exchange my gloves following direct contact with chemical spills and/or contaminated surfaces.

5. I agree to wear clothing that covers and protects my body. Long pants are required for each lab period. Shorts and skirts are not allowed in the lab.

6. I agree to wear footwear that does not allow for any exposed skin. Open-toe, ballet, or flat shoe must be worn with socks. Sandals, flip-flops, and high heels are not allowed in the lab.

7. I will familiarize myself with the location of exits and safety equipment in the lab (safety showers, eyewash stations, fire extinguishers, spill kits, first aid kits, etc.).

8. I will familiarize myself with others working near me and the hazards associated with their experiments. I will communicate with others and make them aware of the hazards associated with my work.

9. Long hair must be kept tied back.

10. I will keep personal belongings not used for my experiments (bags, handbags, coats, and/or jackets) in designated areas off of the floor and out of corridors.

11. Electronic devices, including cell phones are not allowed on the bench during experiments. KEEP IT IN YOUR BAG NOT IN YOUR POCKET.

12. I agree not bring any food or drinks into the lab **(Small tables located outside the lab have been designated for food and drinks).**

13. I will familiarize myself with the hazard documentation (Material Safety Data Sheet (MSDSs) or Safety Data Sheet (SDSs) regarding the chemicals to be used in an experiment.

14. I will not place any glassware, chemicals, or miscellaneous objects into my mouth.

15. I understand smoking is forbidden in the laboratory.

16. I will not use flames in the presence of flammable substances.

17. I will handle all hazardous or volatile chemicals in a fume hood.

18. I will keep my work area clean at all times. Spills will be notified immediately to the instructor.

19. I will perform a visual inspection on all equipment and glassware prior to each use.

20. I will never leave an experiment in progress unattended.

21. I will dispose of all waste material following the proper procedure.

22. I agree to use the appropriate equipment when handling hot objects.

23. I will immediately report defective equipment to the instructor so it can be repaired.

24. I agree to handle chemicals with caution; consequently, I agree to:

a. Read the label carefully before use;
b. Double check to insure the proper reagent is being used;
c. Use clean and dry scooping and measuring equipment.
d. Use only the amount prescribed;
e. Never return unused reagents to the primary container;
f. Return all the reagents to their proper places;
g. Clean up all spills immediately as they occur; and
h. Label the glassware used to hold reagents as to their proper content.

25. I will notify my instructor of chemical sensitivities, allergies or other health issues (such as medications or pregnancy) that might require reduced exposure to certain chemicals.

26. I will immediately report all accidents involving injury, no matter how trivial, to the instructor.

27. I will immediately report all accidents involving spilled chemicals or broken glass, no matter how trivial, to the instructor.

28. In case of direct chemical contact with skin, I will wash abundantly the affected area with running water. Additional actions may be required.

29. I will wash my hands with water and soap before I leave the lab.
FOR TEACHING ASSISTANTS:

30. I understand enforcing the Safety Agreement is part of my responsibility as teaching assistant of the Chemistry Department. Therefore:

a. I will ensure the students follow the safety agreement at all times.
b. I must teach by example; Moreover, I will myself follow this safety agreement at all times.
c. Any safety concerns or observed breakage of safety rules will be immediately communicated to the faculty in charge the course, the laboratory managers, the department safety officer and the Chemistry Department Chairperson, so corrective measures can take place.
d. I understand my Teaching Assistant Contract will be rescinded if proved I had failed to fulfill the safety requirements.

Name: _____ CSU ID:_____

Date: _____

Appendix C

Spill Equipment and Related Safety Equipment

1. Location of Spill Equipment

Spill equipment is available in cabinets located in the following buildings:

a. Basic Science Building (SI); room SI-304

b. Science and Research Building (SR); rooms SR-B52, SR-473, and fourth floor stairwell.

2. List of Spill and Related Safety Equipment

a. Spill Tamer Kit - Contains material for cleanup and disposal of alkali, flammable solvent, acids, and mercury. (each kit contains a spill tamer absorbent, neutralizers for acid and alkalis, mercury tamer, mercury collect containers, gloves, brush and pan, spare disposal bag and a Safety Handbook).

b. Spill Pillows/Absorbent – (material used for chemical, biological and radioactive spills). Refer to the University's Radiation Safety Manual for specific procedures for cleanup of radioactive materials.

c. Fire Extinguishers.

d. Face shields with headgear and visor (worker protection).

e. Chemical resistant gloves (worker protection).

f. Bonding/grounding wire (used for transferring chemicals).

g. OSHA Personal Protection Equipment (PPE) - Response suites with hood and shoe covers (worker protection).

h. Duct Tape.

i. Emergency barricade tape.

j. Plastic bags labeled "Hazardous Waste".

k. Copy of Hazardous Waste Contingency Plan.