The University of Texas at San Antonio

UTSA Chemistry

College of Sciences

Ph.D. Program Handbook

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Chemistry Ph.D. Program Handbook

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Program Overview

The Ph.D. degree in Chemistry is offered by the Department of Chemistry at The University of Texas at San Antonio (https://sciences.utsa.edu/chemistry/). The primary objective of the program is to provide students with a rigorous, research-based education in chemistry with a focus on the sub-disciplines most relevant to the thesis work. This training will ensure that graduates are well prepared to participate and contribute to the chemistry profession in all its facets.

The curriculum is designed to provide an overview of contemporary chemistry through the Core and Elective courses, participation in research seminars and colloquia, teaching opportunities, and, of course, interactions with faculty. All students are required to take 3 out of 5 core courses in Analytical Chemistry, Biochemistry, Inorganic or Organic Chemistry, and Physical Chemistry, as well as two additional developmental courses (Research and Teaching Practice and Ethics, and Proposal Development). Additional required elective courses are normally taken in fields close to the student's area of specialization. Students will have access to laboratories located on the Main Campus in the Biotechnology, Sciences and Engineering (BSE) Building and the Center for Innovative Drug Discovery (CIDD). Students are required to take chemical safety training modules administered by the Lab Safety Department on BioRaft.

Disclaimer

The information contained in this Handbook does not constitute a contract, expressed or implied, between any applicant, student or faculty member and the Ph.D. program in Chemistry, the Graduate School at The University of Texas at San Antonio or The University of Texas System.

Revisions

The Department of Chemistry reserves the right to alter and/or clarify the requirements and procedures set forth in this handbook at any time. Any changes become effective upon approval by the Graduate Curriculum Committee (hereafter GCC) and, if necessary, by faculty vote and University approval. The changes apply to prospective students and may apply to those already enrolled in the Program. **Suggestions from students and faculty for improving the contents of this handbook are encouraged.** Please forward your suggestions to the Department of Chemistry's Graduate Advisor of Record, Department of Chemistry, The University of Texas at San Antonio, One UTSA Circle, San Antonio, Texas 78249-0698.

Typical Timeline for the Ph.D. Degree

The procedures and requirements leading to the Ph.D. degree in chemistry are listed below in the recommended chronological order.

Application

All applications for admission to the Ph.D. program must be made to Graduate Admissions (not the Department of Chemistry). The Department of Chemistry encourages potential applicants to contact the Graduate Advisor of Record or other members of Faculty before submitting applications.

Minimum requirements for admission

- Minimum grade point average (GPA) of 3.0 in the last 60 hours of undergraduate college coursework
- At least two strong letters of recommendation
- Meaningful statement of research interests and career goals (250-500 words)
- Payment of application fee

International applicants are required to prove proficiency in the English language by taking either the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the Duolingo English Test (DET). See International Graduate Student Admission policies for details.

Upon official admission by UTSA, the student will receive an official letter of admission from the Graduate School and a letter of appointment from the Department of Chemistry. This letter stipulates the terms of the appointment and financial support.

Continued support is contingent upon the student remaining in good academic standing (see Academic Standing below) and making satisfactory progress towards the Ph.D. degree according to the timeline listed below. The Department of Chemistry's GCC is responsible for evaluating academic standing and progress and for recommending continued financial support. The student's progress is reviewed annually by the Supervising Professor and another member of the Doctoral Committee at the end of the academic year. The GAR reviews student progress including the adherence to the DRP defense timeline every semester when scheduling the student's classes for the upcoming semester.

Orientation

The Departmental orientation for graduate students takes place at the beginning of each semester. Attendance is mandatory. Topics typically include a general description of the graduate program, courses taught in that semester, and a questions and answer session.

Year-by-Year Milestones for the Ph.D. Degree

Year 1

- Complete 3 core courses earning a GPA of 3.0 or better
- Take Research and Teaching Practice and Ethics
- Complete Laboratory Rotations and select the doctoral research advisor (Supervising Professor)
- Complete Chemical Safety Training in BioRaft
- Attend departmental seminars
- Select Doctoral Studies Committee

Year 2

- Take Research Proposal Development
- Complete coursework (electives)
- Submit Program of Study
- Attend departmental seminars and research colloquia
- Continue dissertation research
- Submit and defend Dissertation Research Proposal (DRP)
- Admission to Candidacy

Year 3

- Conduct research as specified in the Dissertation Research Proposal (DRP)
- Attend departmental seminars and research colloquia
- Take Scientific Presentations
- Continue dissertation research

Years 4 and 5

- Take Scientific Presentations
- Attend departmental seminars and research colloquia
- Complete dissertation research
- Prepare Dissertation
- Submit Dissertation to Doctoral Studies Committee for approval
- Defend Dissertation (Oral examination)
- Submit Dissertation to Graduate School

Program Administration

The Dean of the Graduate School at The University of Texas at San Antonio has overall responsibility for the Ph.D. Program in Chemistry. All doctoral work is subject to approval by the Graduate School and by the Deans. The graduate faculty in the Department of Chemistry, along with the GCC, and Doctoral Graduate Advisor of Record, are responsible for curriculum development and review.

The Ph.D. Program is supervised by the GCC comprising members of the faculty, including the Doctoral Graduate Advisor of Record. The GCC is responsible for establishing admission requirements, overseeing academic curricula, monitoring students' academic progress, attesting eligibility for admission to candidacy for a degree, and verifying to the Graduate School that the student has fulfilled all requirements for the awarding of the degree.

The day-to-day administration of the Ph.D. program is the responsibility of the Doctoral Graduate Advisor of Record (hereafter GAR). The GAR advises all doctoral graduate students, maintains records, and represents the program. Questions about degree requirements and academic policies should be directed to the GAR, who may consult with the GCC.

Requirements and Regulations

Students enrolled in the Department of Chemistry's Ph.D. Program are subject to all established requirements and regulations of the Graduate School of The University of Texas at San Antonio. Refer to the Program Overview section of this Handbook for advice on determining which regulations may apply to your particular circumstances.

Students are strongly encouraged to refer to the current UTSA Graduate Catalog for guidance. This catalog is available in the Department of Chemistry's office and also on-line at http://www.utsa.edu/gcat.

Residency requirement

To establish residency, each doctoral student must spend at least two consecutive Semesters (Fall and Spring, Summer Terms I and II and Fall, or Spring and Summer Terms I and II) in residence as a full-time student taking a minimum of six semester credit hours each long semester and three semester each summer in residence. This stipulation is based on the premise that the scholarship and proficiency required for a Ph.D. degree in Chemistry are best acquired through consistent and concentrated periods of dedicated research efforts in the University environment.

Time Limits

Students have six years from the term of original registration to complete their Ph.D. degree program under the catalog in effect at the time of their initial registration. Financial support is provided for a maximum of five years and requires maintenance of good academic standing. Students are strongly encouraged to complete their Ph.D. requirements within four to five years. Longer times may require prior coursework to be repeated. These time limits may be extended for a maximum of three years for students participating in military service.

Credit Hour Requirements

Students in the Department of Chemistry's Ph.D. program must complete all of the required courses outlined in the section of this Handbook entitled "Coursework Requirements". Students must complete a Program of Study that includes a minimum of 75 semester credit hours of graduate coursework and achieve an overall GPA of at least 3.0. In addition, the student must achieve a grade point average (GPA) of 3.0 or greater (on a 4.0 scale) in organized lecture courses. Note that Graduate Seminar and Research Colloquium are not organized lecture courses.

Transfer of Credit

With the approval of the Graduate School, graduate credit hours (with grades of B or higher) from other universities may be accepted *in lieu* of equivalent required courses. In some cases, graduate courses may be transferred for credit as a chemistry graduate elective course. Students are responsible for requesting course transfer credit. This process involves the submission by the student to the GAR, a brief letter of petition, course description and a copy of the relevant syllabus for each course for which credit transfer is sought. Upon approval by the GCC, a formal petition to Associate Dean for Graduate Affairs in the College of Sciences will be prepared for final ratification by the

Dean of the Graduate School. Credit transfer courses are not included in the computation of a student's GPA.

English Language Requirements

Students are required to possess a competent command of written and spoken English. For international students this requirement is met by obtaining or exceeding the scores in the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the Duolingo English Test (DET). See International Graduate Student Admission policies for details.

Ethics Course Requirement

Students will be required to fulfill any course requirements, for example "Compliance Training", as determined by the Graduate School.

Proposal Development Course Requirement

Students will be required to complete the Proposal Development Course (CHE 7913) in their second year in the Program.

Laboratory Rotations Requirement

Students will be required to complete two one-month rotations in the laboratories of the faculty in the Department of Chemistry in the Fall semester of the first year. Students are expected to spend a minimum of 6 hours per week engaged in laboratory activities within their assigned research group, as well as to attend all group meetings that do not interfere with their classes and teaching responsibilities. The laboratory activities include, but are not limited to research, shadowing of senior students, and discussions with the research supervisor.

Scientific Presentations Course Requirement

Students will be required to take the Scientific Presentations Course either in the Fall or the Spring semester of each year, starting from the third year in the Program.

Supervised Teaching Requirement

A minimum of two semesters of teaching in one or more disciplines of chemistry, under the supervision of one or more members of the Faculty, is required of all doctoral students. This requirement is normally fulfilled as a teaching assistant in either general chemistry or organic chemistry laboratory courses.

Registration

The Office of the Registrar schedules and announces the timing of the registration process to all students, Departments, Departmental Chairman, and their assistants prior to the start of each Semester. Information regarding registration can be found in the ASAP section https://asap.utsa.edu/ of the UTSA. For individual registration concerns, students should consult the Department of Chemistry's GAR.

A student must register each Semester and Summer Terms that s/he is enrolled in the PhD program. This includes courses in Research, Thesis, Dissertation and Graduate Seminars. No student can receive credit for a course for which s/he has not registered.

Semester Credit Hours (SCHs)

One Semester hour of credit is earned through:

1. Lecture clock hours: 15 to 18 (normally 16)
2. Laboratory clock hours: 45 to 60

A course, for example, has a credit value of three Semester credit hours if the class meets for three lecture hours per week during Fall or Spring Semesters.

Full-Time Status

The minimum full-time course load for domestic students is 6 SCHs for the long semesters (Fall and Spring) and 1 SCH the Summer Term. For international students, the requirements are 9 SCH for the long semesters and 1 SCH for the Summer Term. The maximum load is individually determined by the student's Faculty advisor, the GAR, and the GPC.

Doctoral students are required to submit a Request to Travel Authorization (RTA) form in advance for program-related out-of-town travel.

The Ph.D. program in Chemistry is a full-time degree program. Students admitted to the Ph.D. program will receive a stipend and are not permitted to have any other employment beyond their Teaching/Research Assistantships.

Teaching/Research Assistantship Guidelines

Students who receive funding through teaching assistantships or research assistantships also receive tuition and fees to cover the 6/9 SCH taken in the Fall and Spring Semesters, and 1 SCH in the Summer Term. The only exception is for students who are in their final Semester prior to graduation, during which registration for the final dissertation course will be considered a full-time course load. Doctoral students serving as GTAs should limit teaching activities during the Summer Term so that they can focus on research.

Grading System

The following grading system is used for all coursework:

Letter Grade	Grade Points	Meaning of Grade Symbol
A+, A	4	Outstanding
A-	3.67	Outstanding
B+	3.33	Above average (average graduate work)
B	3	Above average (average graduate work)
B-	2.67	Average (average graduate work)
C+	2.33	Average (below average graduate work)
C	2	Average (below average graduate work)
C-	1.67	Average (below average graduate work)
D+	1.33	Below average (failing graduate work)
D	1	Below average (failing graduate work)
D-	0.67	Below average (failing graduate work)
F	0	Failure (failing graduate work)
CR	0	Credit – indicates successful credit by examination or through Faculty evaluation of course work
NC	0	No Credit – indicates unsatisfactory progress

SCHs are awarded only for the grades of A, B, C and CR. All A to F grades are included in the calculation of the GPA. CR/NC grades and their associated course credits do not contribute in any way to the GPA calculation. A grade of F in a course will automatically result in dismissal from the Ph.D. program. Note that in the calculation of GPA, only UTSA courses are included. Students must maintain a GPA of at least 3.0 throughout candidacy.

Other grades may be given that do not contribute to the calculation of the GPA. A grade of W means Withdrawal and indicates that the student was passing at the time of withdrawal. A grade of IN means Incomplete and can be assigned according to university guidelines. A grade of NR means No Report and can only be assigned by the Registrar. A grade of RP means Research in Progress and is applicable to Doctoral Dissertation courses. When the dissertation is complete, the RP grades will be changed to letter grades up to the maximum number of semester credit hours approved for the specific degree.

Academic Standing

A student's academic standing is defined as good standing, academic probation, or academic dismissal. Academic probation describes the standing of a student in one of the following categories:

1. A student who fails to achieve a GPA of 3.0 or higher in any term at UTSA, irrespective of level of courses taken.
2. A student who received a grade of "D+/D/D-" in any course in a term.
3. A student who does not meet all requirements for unconditional or regular admission and who, by special action, is admitted on academic probation.
4. A student who has been reinstated following academic dismissal.

Academic probation is cleared only when none of the above criteria apply and when the student achieves an overall GPA of 3.0 as a graduate student at UTSA. In order to graduate, all graduate students must have a grade point average of at least a 3.0 (on a 4.0 scale). Students on academic probation are encouraged to discuss their status with their academic advisors and/or GAR.

Academic dismissal occurs when a student at the graduate level:

1. Earns a grade point average of less than 2.0 in any term.
2. Earns a grade of "F" in any course.
3. Currently on academic probation and would again be placed on academic probation under the provisions set forth above. If, however, the student's UTSA grade point average for the term is at least 3.0, he or she will continue on academic probation.

Standards for Graduate Support

Students are guaranteed support as Teaching Assistants (TA) and/or Research Assistants (RA), unless their academic standing falls into any of the categories below <u>for two consecutive terms</u>:

- academic probation
- inadequate progress towards degree
- failure to complete an average of 8 credits/long semester
- failure to complete the DRP by end of 5th semester

Summer terms are not counted as semesters in the above requirements.

Students are not guaranteed financial support after their 5th year in the Ph.D. program.

Withdrawal

Permission for withdrawal from the Ph.D. program and the Graduate School may be granted by the Dean of the Graduate School. A student who wishes to withdraw should complete and sign a Withdrawal form available from the Enrollment Services Center. Students who withdraw during a regular "drop period" will receive a grade of "W" in all classes. Students who withdraw after the regular drop date with a passing grade will receive a "W", while those who are failing will receive an "F". Students will then be subject to UTSA's academic standing probation and dismissal regulations. Students who withdraw should refer to the regulations on refunds of tuition and fees, readmission policies, and requirements for maintaining registration.

Leave of Absence

A leave of absence from the Ph.D. program for a maximum of one year may be granted by the Dean of the Graduate School, subject to prior approval by the GCC. Such permission will be granted only for extenuating circumstances and will not be granted when degree progress is unsatisfactory or when a student is on academic probation. Students must apply for a leave of absence to the GAR in writing and include the reason(s) for the request and the expected time of absence. If the request for leave is approved, the student will be notified by letter from the Dean of the Graduate School and complete the Administrative Clearance Form provided by the Graduate School. The student should also drop all courses for which they are currently enrolled.

Non-registration

A student who fails to register for one or more consecutive semesters and does not elect to apply for a leave of absence can be dismissed from the program. If dismissed, the student may re-apply for admission. Such an application will be subject to the same requirements, procedures, and acceptance considerations that apply to first-time applicants.

Transfer to Another Graduate Programs

Any student who wishes to change the course of study from one graduate program to another must make written application to that program. Students who wish to apply for such a transfer must have an interview with the Dean of the Graduate School.

Graduation

The degree of Doctor of Philosophy is awarded by the Board of Regents upon the satisfactory completion of a prescribed Program of Study as documented by the GCC, recommendation of the Graduate School, and certification of the candidate by the Dean and President to the Board of Regents. Degrees are awarded at the end of each spring, summer and fall Semester. Commencement ceremonies are held in May and December. Students who graduate at the end of the Summer Semester may participate in either the May or December ceremony. Information on the procedures to be followed is available in the Office of the Registrar or online at www.utsa.edu/registrar.

Misconduct

Students are responsible for knowing and observing the University's "Procedures and Regulations Governing Student Conduct and Discipline" and the "Rules and Regulations of the Board of Regents of The University of Texas system". This and additional information can be found in the UTSA catalogs (http://www.utsa.edu/gcat) which are available on-line.

Financial Support

It is the intention of the program to ensure that all students are supported for five years. As stipulated in the Ph.D. program offer letter, up to five years of support are guaranteed so long as a student remains in good academic standing. Students in the Department of Chemistry's Ph.D. Program may be supported from several sources, such as the Department of Chemistry's Ph.D. Program, Supervising Professor's research grants, Teaching Assistantships (TA), and Research Assistantships (RA).

Special conditions apply to students receiving support from the Department of Chemistry's Ph.D. Program. This policy does not apply to those receiving support through their advisor's research programs, or other sources. If a student receives support from the Department of Chemistry's Ph.D. Program, s/he will receive a letter containing the following information. Students are expected to agree to these terms as a condition of accepting support.

Students are awarded financial assistance in the form of a twelve-month stipend, the dollar amount of which is specified in the initial offer letter, and which may be subject to annual increases. In addition, the Department will cover student health insurance, tuition and fees. These stipends typically require appointment as a Teaching Assistant (TA) or Research Assistant (RA). This award requires official acceptance by UTSA and is subject to all stipulations in the Department of Chemistry's Ph.D. Program Academic Policies and Procedures Manual in regard to University-funded support of Ph.D. students. It is also dependent upon full-time participation in the Ph.D. program. Employee benefits, such as health insurance, are provided for Teaching Assistants.

In order to be eligible for this financial support, the student must:

1. Be enrolled in the minimum required SCHs during all semesters.
2. Maintain a minimum GPA of 3.0.
3. Not hold outside employment.
4. Complete all core courses during the first year, with a GPA above 3.0.
5. Make satisfactory progress towards the degree including but not limited to completing the Doctoral Research Proposal by the end of the 5th long semester
6. Not be past their 5th year in the Ph. D. program.

Degree Requirements - Overview

The Ph.D. in Chemistry is awarded to candidates who have displayed an in-depth understanding of the subject matter and demonstrated the ability to make an original contribution to knowledge in their field of specialty. The regulations set forth below comply with the general University regulations in the Graduate Catalog (refer to Chapter 2, General Academic Regulations and Chapter 5, Doctoral Degree Regulations).

The Ph.D. degree requires a minimum of 75 semester credit hours beyond the baccalaureate degree. The core curriculum comprises 18 semester credit hours of formal coursework, required teaching, research, and completion of the dissertation following advancement to candidacy. Specific course requirements are listed below. Enrollment in Chemistry Graduate Seminar and/or the Chemistry Research Colloquium (meetings of professors and students in a specific research area) is required each semester of enrollment and may be taken for a maximum combined total of 12 semester credit hours. A minimum of 47 semester credit hours in doctoral research with 2 semester credit hours of Research and Teaching Practice and Ethics, 12 semester credit hours of Directed Research, 21 semester credit hours of Doctoral Dissertation, and 10 semester credit hours of Doctoral Research. Note that at least 12 hours of CHE 6991-3 Directed Research must be completed before the Qualifying Examination and that credit hours for Directed Research in excess of the minimum 18 hours stipulated cannot be transferred to CHE 7921-3 Doctoral Research.

The student must have a grade point average of 3.0 or greater (on a 4.0 scale) in the core courses and elective courses combined. Each student must be a Teaching Assistant (TA) for a minimum of one academic year. Students matriculating with a M.S. degree may use up to 30 semester credit hours toward the Ph.D. degree provided the courses are comparable to core and elective courses. Other degree requirements, including the Qualifying Examination and Written Dissertation are described below.

Course Requirements

- **Required (Core) Courses - 9 SCH** in Analytical Chemistry, Biochemistry, Inorganic Chemistry, Organic Chemistry, and Physical Chemistry.
- **Seminars and Research Colloquium – a maximum of 12 SCH**
- **Electives – 9 SCH** with specific courses chosen by the student in consultation with their supervising professor and Doctoral Studies Committee.
- **Doctoral Research – 45 SCH** of doctoral research including **10 SCH** of Doctoral Dissertation.

TOTAL: 75 semester credit hours (SCH)

Course descriptions are listed on-line.

A. Core curriculum (9 SCH required)

CHE 5263 Advanced Analytical Chemistry
CHE 5313 Advanced Biochemistry
CHE 5453 Advanced Inorganic Chemistry
CHE 5643 Advanced Organic Chemistry
CHE 5843 Advanced Physical Chemistry

B. Colloquia and seminars (maximum of 12 SCH towards degree)

CHE 5981 Graduate Seminar in Chemistry
CHE 7911 Chemistry Research Colloquium

C. Doctoral research (minimum 45 SCH required)

CHE 5992 Research and Teaching Practice and Ethics
CHE 7913 Research Proposal Development
CHE 7941 Scientific Presentations
CHE 5931 Laboratory rotations

CHE 6991-8 Directed Research (minimum 12 hours)
CHE 7921-8 Doctoral Research (minimum 21 hours)
CHE 7931-8 Doctoral Dissertation (minimum 10 hours)

D. Electives (minimum 9 SCH required)

These can be selected from any 5000–7000 level courses offered in Chemistry or from any 5000–7000 level courses offered in other departments with the approval of the GCC.

Choose Supervising Professor/Generate Preliminary Results

By the end of the first semester of Year 1, the student should choose a major research advisor (the Supervising Professor), who must be a member of the Department of Chemistry and the graduate faculty and start to develop knowledge of the supervising professor's research areas. Descriptions of faculty research can be found at https://sciences.utsa.edu/chemistry/faculty/.

Starting from the first or second semester of Year 1, the student should begin research in the supervising professor's laboratory. It is critical that the student develops sufficient laboratory skills to generate preliminary results prior to the Qualifying Examination. The preliminary results should be of sufficient rigor and merit to justify continued investigation and serve as the basis for the proposed dissertation project.

Doctoral Studies Committee

The Doctoral Studies Committee should be chosen no later than the end of first semester of Year 2. The Supervising Professor chairs the Doctoral Studies Committee. Additional members of the Doctoral Studies Committee are chosen by the supervising professor in consultation with the student. The committee must consist of at least four members, of which a minimum of three, including the supervising professor, must be from the Department of Chemistry. In addition, one or more members of the Doctoral Studies Committee must be external to the Department of Chemistry. The external member may be a faculty member in another department at UTSA or a qualified individual from outside the university. If the latter, the GAR should be consulted, because a special application must be made to the Graduate School.

Qualifying Examination

The Qualifying Examination is divided into written and oral portions. The Dissertation Research Proposal (DRP) constitutes the written portion, an oral presentation open to the public, and a defense of the DRP before the Doctoral Studies Committee constitutes the oral portion. The DRP should be based on the student's current and proposed research leading to the dissertation. The purpose of the written DRP and oral defense is to assess the student's ability to coherently describe and defend the thesis research, the unsolved problem(s) to be addressed, and its significance in the context of the general research area. The DRP should describe research that has the potential to generate novel results suitable for publications in peer-reviewed journals, presentations at scientific meetings, and/or patents. Close consultation with the Supervising Professor during preparation of the DRP is encouraged.

The DRP should follow the following format guidelines:

> 10-15 numbered pages, double-spaced, with 1" margins, left-right and top-bottom, minimum of 11 pt font.

A 200-word abstract (does not count towards the page limit)
Specific Aims (with testable hypotheses)
Background and Significance
Preliminary Results
Experimental Plan
Cited References (does not count towards the page limit)

Proposals that do not follow the format will not be accepted.

A hard copy of the DRP should be submitted to the Doctoral Studies Committee at least **two weeks** before the oral defense, and the oral defense should be held no later than one month following submission of the hard copy.

The student's performance on both the oral and written portions shall be evaluated by the Doctoral Studies Committee, which shall recommend either passage or changes in order to remedy deficiencies in the oral and/or written portions. Deficiencies must be remedied within two months of the Doctoral Studies Committee's recommended changes via another oral presentation before the Doctoral Studies Committee and/or presenting hard copies of a suitably amended DRP to the Doctoral Studies Committee.

The Doctoral Qualifying Examination should be taken no later than the end of second semester of Year 2 and will be scheduled in May for all second-year students. A DRP defense can be repeated in the summer of the second year, if the student does not pass the defense in May or if the defense has to be rescheduled. The DRP defense may be postponed till the Fall semester of Year 3 upon request and in consideration of extenuating circumstances. Failure to pass the Qualifying Examination by the end of the Fall semester of Year 3 will result in a grade of F for Directed/Doctoral Research and dismissal from the program. No more than two attempts to pass the Qualifying Examination are permitted. The student is required to answer all questions without any help from the Supervising Professor, who will abstain from providing any clarifications during the DRP defense before the Doctoral Studies Committee.

Admission to Candidacy

All students seeking a doctoral degree at UTSA should be admitted to candidacy by no later than the first semester of Year 3. One of the requirements for admission to candidacy is passing the Doctoral Qualifying Examination, and typically follows soon after passing the Doctoral Qualifying Examination.

Written Dissertation

The student shall write a draft of the Dissertation and submit it for review to the Supervising Professor. The Introduction and Conclusion sections of the Dissertation should not be copied verbatim from any prior publications co-authored by the student. The Introduction should provide a general background for the Dissertation research and describe what scientific problems it aims to solve. The Conclusion section should provide a detailed discussion of the research and major achievements and implications of the thesis work. After appropriate editing, electronic or hard copies of the draft shall be submitted to all members of the Doctoral Studies Committee for further review. Following the final oral examination, the Doctoral Studies Committee makes recommendations for changes to and must approve the final version of the written dissertation.

Final Oral Examination

The final oral examination shall be held no sooner than one week and no later than one month following submission of the written draft to the Doctoral Studies Committee. The final oral examination consists of a public oral presentation (PowerPoint slides should be numbered) of the written dissertation and a closed oral defense. The defense is administered and evaluated by the student's Doctoral Studies Committee and covers the dissertation as well as the general field encompassing the dissertation. The student is required to answer all questions without any help from the Supervising Professor, who will abstain from providing any clarifications during the Dissertation defense before the Doctoral Studies Committee.

Submission of Approved Dissertation to Dean of the Graduate School

Requirements and deadlines for Submission of Dissertation to the Graduate School are available by clicking on the link above. One electronic copy of the thesis or dissertation should be submitted to ProQuest UMI website. The ProQuest submission must be correctly formatted according to the formatting requirements and template; incorrectly formatted final submissions will not be accepted.

Student-Authored Publications

It is expected that upon successful completion of the Ph.D. degree, students will have published several (ideally a minimum of two) research articles in peer-reviewed journals relevant to the field of their dissertation work.

Forms

In order to maintain accurate records and to track student progress, a number of forms require completion. Descriptions and examples of these forms are listed below in approximate chronological order.

PLEASE DOWNLOAD THE LATEST VERSION OF THE FOLLOWING FORMS FROM THE GRADUATE SCHOOL WEBSITE WITH THE LINKS PROVIDED BELOW

Petitions and Other Forms

Petition for Waiver of University Wide Requirements: This form must be completed in order to petition to waive university wide requirements when another form does not exist to complete the request.

Removal of Admissions Conditions: This form should be completed in order to remove conditions placed on a student at the time of admission.

Substitution of Core Courses: This form must be completed in order to petition for substitution of core courses in a student's degree plan.

Transfer of Graduate Credit towards Doctoral Degree: Students are expected to complete all coursework at UTSA. Exceptions require completion of this form and must meet conditions for transfer of credit.

Course(s) Exceeding Time Limitation: This form is required to approve courses that have exceeded the six-year time limitation.

Doctoral Degree to Interim Master's Degree Request: This form must be completed to request an Interim Master's Degree for a student currently in a doctoral program.
Change in Level Classification (Doctorate to Master's): This form must be completed to change a student's level from Doctoral to Master's. Changes in classification are permanent--should a student wish to return to his or her original (doctoral) program after the change in classification has been approved, he or she must reapply to the doctoral program.
Voluntary Withdrawal from a Graduate Degree Program: This form should be completed by the student when he or she wishes to withdraw permanently from a graduate degree program. Once this request is approved, the student must reapply and be readmitted to UTSA to resume graduate enrollment.
Leave of Absence for Doctoral Students: Students enrolled in a doctoral program may apply for a leave of absence each term (Fall or Spring), not to exceed one year, when events such as illness or injury, active military service, or the need to provide care for a family member prevent active participation in the degree program. A Leave of Absence Request should be submitted no later than or during the semester prior to the requested leave. In the event that this is not possible, the request should be submitted as soon as the student is aware that he or she will not be able to register for any given semester.
Leave of Absence Extension Request for Doctoral Students: Students must currently be on an approved Leave of Absence in order to request an extension. The total time for a leave of absence may not exceed one year throughout the degree program. Under no circumstances may a leave of absence be applied retroactively.

Doctoral Forms

Doctoral forms are required for all doctoral students. These forms must be routed to The Graduate School for approval.

Appointment of Doctoral Dissertation Committee: This form establishes the student's dissertation committee.
Completion of the Qualifying Exam: This form must be completed after the student has successfully completed all parts of the qualifying exam.

Application for Candidacy: This form must be filled out by the student and advisor to establish that the student is ready to begin work on the dissertation.

Dissertation Proposal Approval: This form should be submitted to the advisor, dissertation committee, and The Graduate School for approval.

Certification of Completion of Dissertation Requirements: The department will complete this form and route to The Graduate School for approval once the student has met all requirements to graduate.

Milestone Agreement

UTSA Doctoral Program in Chemistry

This document is provided to inform the student regarding the academic milestones that they will be expected to reach to earn their Ph.D. degree in Chemistry. It details when students are expected to complete each of the milestones. Students who are not making satisfactory progress may lose funding, may be placed on academic probation, or may be dismissed from the program.

Academic Advising

The Ph.D. Program is supervised by the GCC comprising members of the faculty, including the Graduate Advisor of Record. The GCC is responsible for establishing admission requirements, approving transfer credits, overseeing academic curricula, monitoring students' academic progress, attesting eligibility for admission to candidacy for a degree, and verifying to the Graduate School that the student has fulfilled all requirements for the awarding of the degree.

The day-to-day administration of the Ph.D. degree in Chemistry is the responsibility of the Graduate Advisor of Record (GAR). The GAR advises all doctoral graduate students, maintains records, and represents the program. Questions about degree requirements and academic policies should be directed to the GAR, who may consult with the GCC.

The Department reviews the progress of all graduate students at the end of each calendar year to determine the student's continued eligibility.

Academic advising includes the following procedures that are established to ensure that the students remain in good academic standing and that students are making satisfactory progress. The GAR is responsible for the following:

- Ensure that students follow the curriculum as approve by the faculty in the Department of Chemistry. The GAR will enroll students in their courses in consultation with the student's thesis advisor.
- The GAR will review the student's progress including the adherence to the DRP defense timeline before the start of each semester while enrolling students in their courses.
- A student's selection of a dissertation advisor must be approved by the Chemistry GCC, the Graduate Advisor of Record and the Department Chair.
- Students will follow the curriculum outlined in the Department of Chemistry Ph.D. Program Handbook unless approved by the GAR in writing to do otherwise.
- Students are expected to complete the program in 5 years or less. Program extensions may be granted on an individual basis and must be approved by the Supervising Professor, the Chemistry GCC, the Graduate Advisor of Record and the Department Chair.

Orientation

The Departmental orientation for graduate students takes place at the beginning of each semester. Attendance is mandatory. Topics typically include a general description of the graduate program, courses taught in that semester, and a questions and answer session.

Year 1

- Complete 3 core courses earning a GPA of 3.0 or higher
- Take Research and Teaching Practice and Ethics
- Complete Laboratory Rotations and select the doctoral research advisor (Supervising Professor)
- Attend departmental seminars
- Select Doctoral Studies Committee

Year 2

- Take Research Proposal Development (Fall)
- Complete coursework (electives)
- Begin writing Dissertation Research Proposal
- Submit Program of Study
- Attend departmental seminars and research colloquia
- Continue dissertation research
- Submit and defend Dissertation Research Proposal (Spring)
- Admission to Candidacy

Year 3

- Conduct research as specified in the Dissertation Research Proposal
- Attend departmental seminars and research colloquia
- Take Scientific Presentations
- Continue dissertation research

Years 4 and 5

- Take Scientific Presentations
- Attend departmental seminars and research colloquia
- Complete dissertation research
- Write Dissertation
- Submit Dissertation to Doctoral Studies Committee for approval
- Defend Dissertation (Oral examination)
- Submit Dissertation to Graduate School

I have read the Milestone Agreement for the UTSA Doctoral Program in Chemistry and have discussed the information in it with my advisor, the graduate advisor of record and the Department Chair. I understand the academic milestones that I am expected to meet during the course of my studies at UTSA. I understand that the failure to meet these milestones according to the schedule presented here may result in the loss of my support, placement of academic probation or dismissal from the program.

_____	_____
Ph.D. Student	Date
_____	_____
Chair, Dissertation Committee	Date
_____	_____
Chair, GCC Date	
_____	_____
Graduate Advisor of Record	Date
_____	_____
Chair, Department of Chemistry	Date

APPENDIX

Roles & Responsibilities of Graduate Teaching Assistants in the Department of Chemistry

The professional development acquired through serving as a Graduate Teaching Assistant (GTA) is a major component of the education of Chemistry graduate students. GTAs assume diverse teaching-related responsibilities, such as serving as laboratory assistants, grading laboratory protocols, quizzes, and exams, assisting with course development, leading discussion sections, acting as lead teaching assistants, and fulfilling other duties in support of the primary instructor or at the request of the Department Chair and/or Assistant Chair

Responsibilities of Graduate Teaching Assistants

Upon accepting the role, GTAs are obligated to conscientiously carry out all duties associated with the position. This includes ensuring sufficient preparation for teaching, timely attendance of all scheduled classes, teaching assistant meetings, labs practice sessions, and office hours, diligent and timely evaluation of student work, and prompt communication with students, faculty, or university administrators in case of any concerns, as appropriate to the situation. If a teaching assistant cannot fulfill a scheduled obligation (e.g., attend a meeting or office hours), they must make arrangements for alternative coverage or rescheduling by obtaining prior approval from their lab coordinator

In the cases of repeated or egregious failures to fulfill the designated responsibilities associated with the teaching role, GTAs may be released from their duties and lose their teaching assistantship. Furthermore, since teaching is a major component of the academic requirements of the Chemistry Graduate Program, failing to meet the obligations of the role may have serious implications for a graduate student's standing in the Program.

GTAs are required to adhere to the UTSA Student Conduct and Community Standards at all times. It is strictly forbidden for GTAs to abuse their position of authority for personal benefits. They must maintain the integrity of their role and refrain from engaging in situations that could result in a conflict of interest. For example, GTAs must carefully examine their class roster(s) and report to the designated course instructor any potential conflicts of interest involving students in the class, such as romantic or business relationships.

Considerations

GTAs will be provided with a desk in a tutoring room assigned by the Department and located in the Science and Engineering Building (SEB) for conducting office hours. Office hours comprised of a total of two hours per week for all assigned courses are required of each GTA and should be conducted only in the assigned tutoring room in SEB.

Grievance Procedures

If a graduate student has a grievance regarding teaching assignments or related issues, all efforts should be made to resolve them with the course instructor or other immediate supervisor of the GTA. If the complaint cannot be resolved satisfactorily at this level, the graduate student may bring this issue before the Assistant Chair of the Department. If there still is no satisfactory resolution, the grievance can be brought to the Department Chair, which will be the final avenue of appeal.

Date: _____

Doctoral Dissertation

Oral Communication Rubric

Student: _____ **Reviewer: _____**

Student Outcome	*Excellent 4*	*Good 3*	*Acceptable 2*	*Needs Improvement 1*
Quality of presentation materials Score: _____	Content is **original, accurate** in facts and evidence. Presentation is **orderly, purposeful**, topics are **clearly identified**, and presentation **flows smoothly.** Graphics are **appropriately sized and positioned, clear,** and **easily understandable.**	Content is **mostly original and accurate** in facts and evidence. Presentation is **mostly orderly** and **purposeful**, topics are **clearly identified**, and presentation **for the most part flows smoothly.** Graphics are **mostly appropriately sized and positioned, clear,** and **easily understandable.**	Content **reveals sufficient effort in originality and accuracy** of facts and evidence. Presentation is **reasonably orderly** and **purposeful**, topics are **clearly identified**, and the presentation flow is **sufficiently smooth.** Graphics are **sufficiently well-prepared but are somewhat misaligned, ineffective, unclear,** or **understandable.**	Content **reveals minimal effort in originality and accuracy** of facts and evidence. Presentation is **not orderly** and **purposeful**, topics are **not clearly identified**, and the presentation flow is **not smooth.** Graphics are **poorly prepared, misaligned, ineffective, unclear,** and are **not easily understandable.**
Mastery of the subject Score: _____	**Presentation** reveals **outstanding** depth of subject knowledge, **exceptionally well developed** critical thinking skills, and a **substantial** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **good** depth of subject knowledge, **well developed** critical thinking skills, and a **notable** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **a suffcient** depth of subject knowledge, **fairly well developed** critical thinking skills, and a **reasonable** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **a minimal** knowledge of the subject, **undeveloped** critical thinking skills, and a **lack** of the ability to interconnect and extend knowledge from the literature to the dissertation research.
Quality of responses to questions Score: _____	Questions are handled **skillfully** and answered **thoroughly**	Answers reveal a **significant** skill and are **mostly thorough**.	Questions are handled **sufficiently skillfully** and are answered **reasonably well**	Questions are **answered poorly** or **mostly not answered**
Delivery preparation and techniques Score: _____	The speaker appears polished and confident; has **obviously practiced delivery multiple times.** Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) **make the presentation compelling.**	The speaker appears comfortable and **has likely practiced several times**. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation **interesting.**	The speaker appears **somewhat uncomfortable** and **somewhat lacking in practice** but is **sufficiently well prepared**. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation **understandable.**	The speaker appears uncomfortable, **obviously has not practiced** and is does not seem to know the content. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) **detract from the understandability of the presentation.**

Average score for the written and oral rubrics of 28 or above: Meritorious Dissertation Award

Average score for the written and oral rubrics of 12 or below: failure to pass the defense

Date: _____

Doctoral Dissertation

Written Communication Rubric

Student: _____ **Reviewer: _____**

Student Outcome	*Excellent 4*	*Good 3*	*Acceptable 2*	*Needs Improvement 1*
Ability to summarize prior research and contextualize research goals Score: _____	The **introduction** provides a **critical and thorough review** of the **relevant literature** that leads to a **clear, concise and accurate** description of the research problem(s) and aims, significance of the work, and the research design.	The **introduction** provides a **thorough review** of the **relevant literature** that provides **some well formulated critical analysis** and leads to a **mostly clear, concise and accurate** description of the research problem(s) and aims, significance of the work, and the research design.	The **introduction** provides a **reasonably detailed review** of the literature with **enough critical analysis** that leads to **sufficiently clear, concise and accurate** description of the research problem(s) and aims, significance of the work, and the research design but **somewhat lacks in clarity or relevance, and omits some key points**.	The **introduction** does not provide a sufficiently detailed **review** of the literature with **little or no critical analysis** and **incoherent, inaccurate, or lacking** description of the research problem(s) and aims, significance of the work, and the research design.
Research design and execution Score: _____	The **research design** is **well-reasoned** and **appropriate**, as evidenced by a **large body of research results** that are supported by **detailed, well-organized, and extensive scientific data**, demonstrating **a deep understanding** of methods, research strategies, and potential problems.	The **research design** is **mostly well-reasoned** and **appropriate**, as evidenced by a **significant body of research results** that are supported by **reasonably well-organized and detailed scientific data**, demonstrating **a good understanding** of methods, research strategies, and potential problems.	The **research design** is **sufficiently well-formulated**, as evidenced by **research results** that are supported by **sufficient scientific data**, demonstrating **appropriate understanding** of methods, research strategies, and potential problems.	The research design has **significant weaknesses** and is **inappropriate**, as evidenced by **minimal research results** that are supported by **insufficient and poorly organized or lacking scientific data**, demonstrating **poor** understanding of methods, research strategies, and potential problems.
Ability to summarize the research project(s) Score: _____	Demonstrates **outstanding subject knowledge and mature critical thinking** in summarizing **key points, significance and innovation** of the research project(s)	Demonstrates **broad knowledge and well-developed critical thinking** in summarizing **key points, significance and innovation** of the research project(s)	Demonstrates **acceptable knowledge and critical thinking** in summarizing **key points, significance and innovation** of the research project(s), with some **minor points missing or unclear**	Demonstrates **minimal subject knowledge and critical thinking** in summarizing **key points, significance and innovation** of the research project(s), with **many key points missing unclear**
Quality of writing, graphics, and formatting Score: _____	The writing is **compelling, concise, accurate, and effective.** Graphics are **appropriately sized, clear, virtually error-free,** and **easily understandable.** The text and references are also well-formatted and **virtually error-free.**	The writing is sufficiently compelling, concise, accurate, and mostly effective. Graphics are mostly **appropriately sized, clear, easily understandable, and contain few errors.** The text and references are also **well-formatted** and contain **few errors.**	The writing is **reasonable** but **somewhat lacking in accuracy and effectiveness**. Graphics are **somewhat unclear and disorganized and contain a significant number of errors.** The text and references are somewhat **lacking in attention to appropriate format** and contain **some errors.**	The writing is **ineffective, mundane, and inaccurate**. Graphics are too small**, unclear, poorly organized, and contain many errors.** The text and references **are not appropriately formatted** and contain **many errors.**

Average score for the written and oral rubrics of 28 or above: Meritorious Dissertation Award

Average score for the written and oral rubrics of 12 or below: failure to pass the defense

Date:

Doctoral Research Proposal

Oral Communication Rubric

Student: **Reviewer:**

Student Outcome	*Excellent 4*	*Good 3*	*Acceptable 2*	*Needs Improvement 1*
Quality of presentation materials Score: _____	Content is **original, accurate** in facts and evidence. Presentation is **orderly, purposeful**, topics are **clearly identified**, and presentation **flows smoothly.** Graphics are **appropriately sized and positioned, clear,** and **easily understandable.**	Content is **mostly original and accurate** in facts and evidence. Presentation is **mostly orderly** and **purposeful**, topics are **clearly identified**, and presentation **for the most part flows smoothly.** Graphics are **mostly appropriately sized and positioned, clear,** and **easily understandable.**	Content **reveals sufficient effort in originality and accuracy** of facts and evidence. Presentation is **reasonably orderly** and **purposeful**, topics are **clearly identified**, and the presentation flow is **sufficiently smooth.** Graphics are **sufficiently well-prepared but are somewhat misaligned, ineffective, unclear,** or **understandable.**	Content **reveals minimal effort in originality and accuracy** of facts and evidence. Presentation is **not orderly** and **purposeful**, topics are **not clearly identified**, and the presentation flow is **not smooth.** Graphics are **poorly prepared, misaligned, ineffective, unclear,** and are **not easily understandable.**
Mastery of the subject Score: _____	**Presentation** reveals **outstanding** depth of subject knowledge, **exceptionally well developed** critical thinking skills, and a **substantial** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **good** depth of subject knowledge, **well developed** critical thinking skills, and a **notable** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **a suffcient** depth of subject knowledge, **fairly well developed** critical thinking skills, and a **reasonable** ability to interconnect and extend knowledge from the literature to the dissertation research.	**Presentation** reveals **a minimal** knowledge of the subject, **undeveloped** critical thinking skills, and a **lack** of the ability to interconnect and extend knowledge from the literature to the dissertation research.
Quality of responses to questions Score: _____	Questions are handled **skillfully** and answered **thoroughly**	Answers reveal a **significant** skill and are **mostly thorough**.	Questions are handled **sufficiently skillfully** and are answered **reasonably well**	Questions are **answered poorly** or **mostly not answered**
Delivery preparation and techniques Score: _____	The speaker appears polished and confident; has **obviously practiced delivery multiple times.** Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) **make the presentation compelling.**	The speaker appears comfortable and **has likely practiced several times**. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation **interesting.**	The speaker appears **somewhat uncomfortable** and **somewhat lacking in practice** but is **sufficiently well prepared**. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation **understandable.**	The speaker appears uncomfortable, **obviously has not practiced** and is does not seem to know the content. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) **detract from the understandability of the presentation.**

Average score for the written and oral rubrics of 15 or below: failure to pass the DRP defense.

15–20 points: conditional pass with the conditions set by the student's doctoral committee.

20–40 points: passed the DRP defense.

Date:

Doctoral Research Proposal

Written Communication Rubric

Student: **Reviewer:**

Student Outcome	*Excellent 4*	*Good 3*	*Acceptable 2*	*Needs Improvement 1*
Abstract Score: _____	The **abstract** provides a **clear, concise and accurate** description of the research problem(s) and aims, significance of the work, and the research design.	The **abstract** provides a **mostly clear, concise and accurate** description of the research problem(s) and aims, significance of the work, and the research design.	The **abstract** provides a **reasonably accurate** description of the research problem(s) and aims, significance of the work, and the research design but **somewhat lacks in clarity or omits some key points**.	The **abstract lacks in clarity and does not provide an accurate** description of the research problem(s) and aims, significance of the work, and the research design**.**
Specific aims Score: _____	**Specific aims** are **clearly stated, skillfully crafted** and **accurately** describe the purpose and goals of the proposed research.	**Specific aims** are **mostly well written** and describe the purpose and goals of the proposed research with **sufficient clarity.**	**Specific aims** provide a **reasonably clear** description of the purpose and goals of the proposed research.	**Specific aims** provide a **minimal and inaccurate** description of the purpose and goals of the proposed research or **demonstrate minimal understanding** of the research goals.
Significance and impact of the proposed research Score: _____	**Significance and impact of the proposed research** are **clearly articulated,** demonstrating **a deep understanding** of the research problem(s) and the potential outcomes of the proposed work.	**Significance and impact of the proposed research** are **mostly clearly articulated**, demonstrating a **good understanding** of the research problem(s) and the potential outcomes of the proposed work.	**Significance and impact of the proposed research** are **reasonably clearly articulated**, demonstrating some **understanding** of the research problem(s) and the potential outcomes of the proposed work.	**Significance and impact of the proposed research** are not well described and demonstrate **minimal understanding** of the research problem(s) and the potential outcomes of the proposed work.
Research design Score: _____	The **research design** is **well-reasoned** and **appropriate** for accomplishing the specific aims, demonstrating **a deep understanding** of methods, research strategies, and potential problems.	The **research design** is **mostly well-reasoned** and **appropriate** for accomplishing the specific aims, demonstrating **a good understanding** of methods, research strategies, and potential problems.	The **research design** is **reasonable** and mostly **appropriate** for accomplishing the specific aims, demonstrating **some understanding** of methods, research strategies, and potential problems.	The research design has **significant weaknesses** and is inappropriate to accomplish the specific aims, demonstrating **minimal** understanding of methods, research strategies, and potential problems.
Literature Score: _____	**Demonstrates skillful use of the relevant literature** to support the proposed research and discuss prior art.	**Demonstrates thoughtful use of the literature** to support the proposed research and discuss prior art. The literature is **mostly relevant** and **carefully** selected.	Demonstrates an **attempt to use the relevant literature** to support the proposed research and discuss prior art. The literature is **reasonably relevant** and selected.	**Barely demonstrates an attempt to use credible sources** to support the proposed research and discuss prior art. **Key references are missing or the literature is not relevant.**
Quality of writing, graphics, and formatting Score: _____	The writing is **compelling, concise, accurate, and effective.** Graphics are **appropriately sized, clear, virtually error-free,** and **easily understandable.** The text and references are also well-formatted and **virtually error-free.**	The writing is sufficiently compelling, concise, accurate, and mostly effective. Graphics are mostly **appropriately sized, clear, easily understandable, and contain few errors.** The text and references are also **well-formatted** and contain **few errors.**	The writing is **reasonable** but **somewhat lacking in accuracy and effectiveness**. Graphics are **somewhat unclear and disorganized and contain a significant number of errors.** The text and references are somewhat **lacking in attention to appropriate format** and contain **some errors.**	The writing is **ineffective, mundane, and inaccurate**. Graphics are too small**, unclear, poorly organized, and contain many errors.** The text and references **are not appropriately formatted** and contain **many errors.**