

**University of California, Merced**

**Graduate Group in Physics and Chemistry**

**Policies and Procedures**

**Academic Year 2010–2011**

## **SCOPE OF RESEARCH**

Research in the Physics and Chemistry Graduate Group spans the traditional disciplines of chemistry and physics and related interdisciplinary fields.

## **GRADUATE ADMISSIONS**

All persons seeking admission to graduate standing must make formal application for admission through the Graduate Division's on-line application system. Applications are reviewed by the Admissions Committee, which makes recommendations on admission to Graduate Studies; the Dean of Graduate Studies makes final decisions on admission.

## **APPLICATION DEADLINES FOR ADMISSION**

The deadline for receipt of applications is January 15. Late applications will be considered as space permits. Normally applications will be accepted for Fall semester only.

## **MATERIALS TO BE SUBMITTED**

- \* The complete official application form;
- \* The application fee;
- \* All official university/college/junior college transcripts;
- \* An official Graduate Record Exam (GRE) score report. Only the general tests are required, but the subject test in physics, chemistry, or mathematics is also recommended;
- \* Three letters of recommendation from instructors or supervisors who can comment on the applicant's scholarly ability and promise as a researcher;
- \* Official score reports from the Test of English as a Foreign Language (TOEFL) if the applicant's native language or language of instruction is other than English.

## **ADMISSION CRITERIA**

The minimum requirement for graduate admission to UCM is a bachelor's degree, or any other degree or certificate which the Graduate Council accepts as equivalent, and a grade point average no lower than 3.0 on a 4.0 scale. Performance on the GRE, accomplishments in undergraduate research, and letters of recommendation will also be evaluated as important determinants of an applicant's potential for success in graduate education. Foreign students from non-English speaking countries are required to attain a minimum score on the TOEFL exam of 580 (paper version) or 92 (internet-based version). Students from non-English speaking countries will normally be interviewed by telephone by a member of the Admissions Committee in order to evaluate English proficiency.

## **GENERAL REQUIREMENTS FOR ADVANCED DEGREES**

### **RESIDENCY**

Students registered in regular University courses as a full-time student are regarded as being in residence. Students must enroll for a minimum of 12 units per semester to be considered in full-time status.

### **SCHOLARSHIP**

Graduate students must maintain at least a 3.0 grade-point average to be considered in good academic standing or to be awarded an academic graduate degree. A student whose cumulative graduate grade-point average falls below 3.0, or who is judged not to be making satisfactory progress toward the degree by his or her graduate advisor or faculty committee, will be placed on academic probation. The student will then be allowed a maximum of two semesters to make up the deficiencies and be returned to good academic standing. Otherwise, the student will be dismissed from the graduate program.

### **FACULTY COMMITTEES FOR ADVANCED DEGREES**

The graduate advisor, normally in consultation with the student, the major professor and program faculty, recommends appointment of faculty members to advise on and supervise the student's dissertation research, serve on examination committees, and review and pass upon the merits of the doctoral dissertation. Final approval of the membership on these committees rests with the Dean of Graduate Studies.

Advanced degree committees in the Physics and Chemistry group normally consist of four members. One is the student's major professor, two are other UC Merced faculty members in the group (one of whom is appointed as Chair), and one is from outside the group. This outside member may be a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vitae and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Dean of Graduate Studies for review and approval.

All members of the committee must be in attendance for Ph.D. qualifying and final examinations or Master's comprehensive oral examination (Plan II). All members of the committee must approve the Master's thesis (Plan I) or Ph.D. dissertation. If a committee member's absence from campus for an extended period of time makes scheduling of examinations unreasonably difficult, the student may request that the committee be reconstituted. Reconstitution of the committee may also be justified by a substantial change in the student's thesis topic or may be required by the departure of a committee member from the university. When membership changes must be made, the graduate advisor in consultation with the student should recommend a new committee member, giving the reason for the change. The reason must be acceptable to the Dean of Graduate Studies.

### **DOCTORAL DEGREE**

### **SIGNIFICANCE**

The Doctor of Philosophy degree is not granted by the University of California merely for the fulfillment of technical requirements, such as residence or the completion of fundamental courses. The recipient of a Ph.D. degree is understood to possess thorough knowledge of a broad field of learning and to have given evidence of distinguished accomplishment in that field; the degree is a warrant of critical ability and powers of imaginative synthesis. The degree also signifies that the recipient has presented a doctoral dissertation containing an original contribution to knowledge in his or her chosen field of study.

## **REQUIREMENTS**

The Physics and Chemistry group has established the following requirements for the Ph.D. degree:

- Complete at least four semesters of full-time academic residence (12 units minimum) at UC Merced;
- Complete the required courses for one of the three emphasis tracks as described below, with a letter grade of at least "B" in each course ("S" in seminar courses graded S/U);
  - Earn a passing grade in a course addressing scientific ethics, approved by the Educational Policy Committee;
  - Serve as a teaching assistant for at least one semester;
  - Pass the preliminary examination;
  - Pass the oral Ph.D. qualifying examination;
  - Present an open technical seminar at least once each calendar year in residence (Physical Chemistry and Organic Chemistry emphases only);
  - Present and successfully defend a doctoral dissertation containing an original contribution to knowledge in the field.

## **SELECTION OF A MAJOR PROFESSOR**

The heart of the Physics and Chemistry Ph.D. program is the completion of a piece of original scientific research leading to the preparation and defense of a Ph.D. thesis. To this end, each student should discuss research interests and possible Ph.D. projects with all of the faculty in the group as early as possible, and select a faculty research advisor (major professor) early during the second semester of study. Selection of a major professor must be approved by the graduate advisor and must occur before the student's faculty committee can be constituted. The student and the major professor together will develop a research topic, and research will normally occupy a majority of the student's time after the first year of residence. Interdisciplinary projects are highly encouraged, as are research collaborations with faculty or senior scientists outside UC Merced. However, the major professor must be a member of the Physics and Chemistry group.

## **PRELIMINARY EXAMINATION**

All students in the group are required to pass a written preliminary examination that tests undergraduate-level understanding of the fundamental concepts in the field. This exam is administered twice each year, at the beginning of Fall and Spring semesters. Separate exams are offered in physics, physical chemistry, and organic chemistry; each student should take the exam

that most closely corresponds to his or her research area. Students may elect to take the exam for the first time at the start of either the first or second semester in residence. The exam may be taken once each time it is offered, but must be passed no later than the start of the fourth semester (a maximum of four attempts). Students who have not passed the exam by the start of the fourth semester may be subject to dismissal.

## COURSEWORK REQUIREMENTS

The minimum coursework requirements are determined by the student's research area. Each emphasis area requires both core courses and one or more electives as follows:

- Physics

The Physics courses offered include both core and elective courses. The current list:

Quantum mechanics I (core, PHYS 237)

Quantum mechanics II (PHYS 238)

Electrodynamics and Optics I (core, PHYS 210)

Classical Mechanics (PHYS 205)

Statistical Mechanics (core, PHYS 212)

The course requirements include completion of 3 core courses within the first 4 semesters, and 3 electives anytime within the duration of the PhD study. In addition, we require attending 4 semesters of PHYS 293, which is the Physics Seminar series.

The requirements along with a timeline are summarized here:

	1 <sup>ST</sup> YEAR	2 <sup>ND</sup> YEAR	3 <sup>RD</sup> YEAR	4 <sup>TH</sup> YEAR	5 <sup>TH</sup> YEAR
Prelim Exam	Must be completed				
Core courses	PHYS 237, 210, 212 must be completed				
Candidacy		Advance to candidacy			
Electives	Can be completed at any time				
Seminar	Four semesters of Phys 293				

The electives include PHYS 238, PHYS 205 and any other PHYS 2xx courses which may be offered in the future. Courses offered by other graduate programs (Applied Math, QSB, BEST, etc.) may also be included in the list of electives. Any elective must be at least 3 units and we require at least one elective be a course outside the student's primary research area, which can be selected by discussion with the student's thesis advisor or the graduate group advisor for Physics.

A student may ask for postponement/extension of the timeline shown above but to do so will require the permission of the graduate group advisor for Physics.

If a student would like to attain a waiver for any of the courses above, the rules are:

1. No waiver will be granted unless the student has passed the preliminary exam.
2. For waivers regarding elective courses, a student can only ask for a waiver on one elective course. All core courses can be waived if competency is demonstrated.
3. For a waiver on any of the courses, the student will need to attain the waiver from the faculty member who taught the course most recently. The faculty member granting the waiver will only do so if the student can successfully complete an exam in the course. This exam can be given at any time at the faculty and student's convenience, any time of the year. The final decision to grant the waiver will be taken by the Graduate Division.

Special circumstances for 2007 and 2008 admits: Graduate students admitted in Fall 2007 and Fall 2008 to the graduate program may substitute QM II (Phys 238) or Classical Mechanics (Phys 205) in place of one of the three core courses. This substitution will not be allowed for any admissions hereafter.

- Physical Chemistry

Quantum mechanics or quantum chemistry (CHEM 212 or PHYS 237)

Thermo/stat mech (CHEM 213 or PHYS 212)

Molecular spectroscopy (CHEM 231)

One graduate course elective (numbered 2xx and at least 3 units)

Four semesters of graduate seminar courses

- Organic Chemistry

Advanced organic synthesis (CHEM 200)

Reaction mechanisms (CHEM 201)

Two graduate course electives (numbered 2xx and at least 3 units each)

Four semesters of graduate seminar courses

Course electives must be regular graduate courses (not research or independent study). Courses offered by other graduate programs may be taken as electives but require approval of the major professor. Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the major professor.

## PH.D. QUALIFYING EXAMINATION

All students in the Physics and Chemistry Ph.D. program are required to pass an oral qualifying examination before advancement to candidacy for the Ph.D. degree. Students are expected to take and pass the qualifying examination during their second year of graduate study unless they successfully petition the Educational Policy Committee to take it at a specific later date. The qualifying examination may not be scheduled until the preliminary examination has been passed and at least three of the required non-seminar graduate courses have been completed (three core courses for the Physics track). The intent of this examination is to ascertain the breadth of a student's comprehension of fundamental facts and principles that apply in his or her major field of study. It will also determine the student's ability to think critically about the

theoretical and practical aspects of the field. Accordingly, the examination should be focused on the student's field of research but may and should venture into other areas of scholarship that underlie or impinge on the thesis topic.

The examination committee is the same as the student's faculty committee. The major professor is a voting member of the committee, but will normally not participate in the examination except to provide technical clarifications as requested by the other members of the committee.

The date of the examination is arranged between the student and the committee chairperson. At least one week prior to the examination date, the student will provide to the committee a written document (typically five to ten pages) that describes his or her research topic, summarizes progress to date, and outlines what he or she proposes to do, why it is relevant, and what will be learned. The committee conducts the examination, and immediately thereafter submits the results of the examination to Graduate Studies. The committee members should include in their deliberations such factors as relevant portions of the previous academic record, performance on the examination, and an overall evaluation of the student's performance and potential for scholarly research as indicated during the examination. A unanimous decision is required for a "Pass". If not all members of the committee vote to pass, they must write a report explaining their decision and must inform the student of the reasons for the decision.

A student who has not passed the examination may repeat the qualifying examination after a preparation time of at least three months. The examination must be held by the same committee except that members may be replaced, with the approval of the graduate advisor, for cause such as extended absence from the campus. Failure to pass the examination on the second attempt means that the student is subject to disqualification from further study for the doctoral degree.

### ADVANCEMENT TO CANDIDACY

Upon successful completion of the examinations, the student is given an application for advancement to candidacy by the examining committee chair. When it is filled out and signed by the graduate advisor and major professor, the student pays a candidacy fee and submits the form to Graduate Studies. Upon advancement to candidacy for the degree, the faculty committee is then charged to guide the student in research and in the preparation of the dissertation.

### SEMINARS

All students in the Chemistry group are required to present an open technical seminar at least once each year. The topic of the seminar may be the student's own research or it may be any other topic that falls within the areas of study spanned by the group, broadly defined. The seminar may be presented as part of a regular seminar series or, if necessary, as a special seminar. The open presentation given as part of the Ph.D. defense may be counted as one of the required seminars.

## **DISSERTATION AND FINAL EXAMINATION**

The Ph.D. dissertation must be creative and independent work that can stand the test of peer review. The expectation is that the material will serve as the basis for publication(s) in a peer-reviewed journal. The work must be the student's, and it must be original and defensible. The student is encouraged to discuss with members of the faculty committee both the substance and the preparation of the dissertation well in advance of the planned defense date. Detailed instructions on the form of the dissertation and abstract may be obtained from the Graduate Studies office.

The student must provide a copy of the dissertation to each member of the faculty committee and allow each committee member at least four weeks to read and comment on it. If one or more committee members believe that there are significant errors or shortcomings in the dissertation or that the scope or nature of the work is not adequate, the student must address these shortcomings before scheduling a defense. Once the committee members are in agreement that the dissertation is ready to be defended (although minor errors or matters of controversy may still exist), the final examination date may be scheduled by the student in consultation with the committee. The date must be reported to the Dean of Graduate Studies, and one copy of the dissertation filed, no later than three weeks before the proposed date of the final examination.

The Ph.D. final examination consists of an open seminar on the dissertation work followed by a closed examination by the faculty committee. During the examination, the student is expected to explain the significance of the dissertation research, justify the methods employed, and defend the conclusions reached. At the conclusion of the examination, the committee shall vote on whether both the written dissertation and the student's performance on the exam are of satisfactory quality to earn a University of California Ph.D. degree. A majority is required for a pass. Members of the committee may vote to make passing the exam contingent on corrections and/or revisions to the dissertation. In this case, the committee will select one member, normally the major professor, who will be responsible for approving the final version of the dissertation that is submitted to Graduate Studies.

## **MASTER'S DEGREE**

### **SIGNIFICANCE**

Students are normally admitted to the graduate program in Physics and Chemistry to work toward the Ph.D. degree. However, a student who has been in residence for at least two semesters, is in good academic standing, and has passed the preliminary exam may petition the Admissions Committee to pursue a terminal M.S. degree. The recipient of a M.S. degree is understood to possess knowledge of a broad field of learning that extends well beyond that attained at the undergraduate level, but is not necessarily expected to have made a significant original contribution to knowledge in that field.

### **REQUIREMENTS**

The Physics and Chemistry group has established the following requirements for the M.S. degree.



Two different tracks are recognized:

#### PLAN I

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Pass the preliminary examination;
- Complete at least 20 semester hours of upper-division and graduate course work with a cumulative grade-point average of at least 3.0. At least 12 semester hours must be from regular, letter-graded lecture and discussion courses, while the remaining 8 hours may be research or similar courses;
- Prepare an acceptable thesis describing original research in the field.

#### PLAN II

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Pass the preliminary examination;
- Complete at least 24 semester hours of upper-division and graduate course work with a cumulative grade-point average of at least 3.0. At least 16 semester hours must be from regular, letter-graded lecture or discussion courses, while the remaining 8 hours may be research or similar courses;
- Pass a comprehensive oral examination administered by the faculty committee. This examination will test the student's understanding of the main concepts in the field at the graduate level.

### **TIME TO DEGREE AND ANNUAL EVALUATION OF GRADUATE STUDENT PROGRESS**

The Physics and Chemistry group places no strict limits on the length of time a graduate student may remain in residence. However, it is normally expected that successful completion of the Ph.D. will require no more than five years.

In order to ensure satisfactory progress toward the degree, each student must meet with his or her faculty committee for an annual review of progress at a mutually agreeable time prior to the first day of each Fall semester. At least three members of the committee, including the major professor, must be present. The committee will review the student's progress toward the degree during the past year and develop a time table, mutually agreeable among student, major professor, and faculty committee, for completion of the remaining requirements. The annual report of the committee will become part of the student's record.

Should the committee conclude that the student is not making satisfactory progress toward the degree, the student may be placed on academic probation as described under "Scholarship" above.

## TEACHING AND RESEARCH ASSISTANTSHIPS AND STIPENDS

1. Newly admitted students will normally be supported as graduate TAs during their first two semesters in residence. After that, students will be supported as either TAs or GSRs depending on availability of TAs and the research advisor's funding situation.
2. New students who cannot be appointed as TAs because of limited English proficiency or lack of available TA positions may be appointed as GSRs for their first one or two semesters by mutual agreement of the student and the research advisor. The conditions of appointment will be the same as in #3 and #4 below. Normally all students will be required to TA for at least one semester as long as a suitable TA position is available. TA experience at other institutions could satisfy this requirement.
3. Graduate students serving as GSRs during the academic year will be appointed at 49.9% at the step for which the monthly stipend is most nearly equal to that for a first-year TA in the Natural Sciences. There will be no additional or reduced pay during break periods.
4. Graduate students serving as GSRs during the summer will be appointed at the step determined in #3 above. The appointment will be 60% for students who have not yet been advanced to candidacy for the Ph.D. degree, and 70% for those who have been advanced to candidacy. Students are expected to spend the remainder of their time pursuing independent study toward the degree. GSRs do not accrue paid vacation time.
5. These policies should be revisited and revised as necessary on an annual basis.
6. Exceptions to these policies may be made at the recommendation of the student's research advisor, the graduate group chair, and the graduate dean.