CHEMICAL PHYSICS
GRADUATE STUDY GUIDELINES

A Collection of Program and University Regulations
and Operating Procedures

Chemical Physics Ph.D. Program
Departments of Chemistry and Physics
University of Nevada, Reno

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This brochure is designed to present the most pertinent information on the courses, examinations, and other requirements of the Chemical Physics Ph.D. program. The UNR General Catalog should be consulted for authoritative information.

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1 Entry into the Graduate Program in Chemical Physics

1.1 Admission into the Program

The Chemical Physics program confers only the Ph.D. degree. Master’s degree students follow the course of study laid out by either the physics or chemistry department. Admission of a student into the Chemical Physics program can occur by one of three routes: either (i) direct admission into the Chemical Physics Ph.D. program following the completion of an undergraduate or Master’s degree, or (ii) admission into the Ph.D. degree program of either the chemistry or physics department with subsequent induction into the Chemical Physics program upon satisfactory performance in courses and/or the comprehensive examination (see below).

Admission into the program will be decided by the individual departments’ admissions committees under consultation with the Chemical Physics Program director. The department through which a student gains admission to the program will henceforth be referred to as the “admitting department.” Financial support for an incoming student, usually in the form of a teaching or research assistantship, is administered by the admitting department and/or by individual research groups.

1.2 Graduate Record Examination Scores and Transcripts

Scores on the Graduate Record Examination (GRE) must be filed with the Graduate School by the student prior to admission to graduate standing. The Graduate School requires an undergraduate grade point average of 3.0 or better for formal admission into a Ph.D. program at the university. A student entering the program upon completion of a Master’s degree may use the graduate grade point average to meet this requirement.

1.3 Registration Exams

Registration exams are administered separately by the chemistry and physics departments to all entering graduate students prior to registration. They are used to assess each student’s background and to search out deficiencies in the student’s background in molecular physics or physical chemistry so that more effective course advisement can be given. Chemical physics students gaining admission to the program through the chemistry department are required to take the registration exam in physical chemistry, as well as exams in mechanics (covering basic Newtonian mechanics at the level of a first-semester course in physics) and mathematics (covering calculus, differential equations, and some complex analysis). The registration exams also serve the role of the Qualifying Examinations required by the Graduate School for the Ph.D. program (consult the catalog).

1.4 Curriculum

The Chemical Physics program curriculum consists of a core of 15 credits of required courses (5 courses), 31 credits of electives [of which12 credits maybe “Independent Study”, 3 maybe “Dissertation”, and 8 credits may be “Physical Chemistry Colloquium”], 2 credits of student seminar (Chemistry 790 or Physics 790), and 24 credits of “Dissertation”. The five required courses are
Students must take at least two 700-level courses in each of the Chemistry and Physics departments to satisfy their course requirements. Elective courses at the 600- or 700-level must be approved by the student’s Graduate Advisory Committee.

1.5 Choice of Research Advisor

The Chemical Physics program requires a completed research dissertation. During the first semester in residence, each student should consult with the various faculty members associated with the Chemical Physics program. These consultations should be arranged by the student. They generally involve discussion of the type of research programs of interest to the faculty member. After these consultations, the student chooses a faculty member under whose direction the dissertation research will be performed. The faculty member is asked by the student to serve as the student’s research director and advisor. Choice of the research director should be made no later than the end of the second semester of graduate studies. A list of those faculty affiliated with the Chemical Physics program and their research area is given below.

**Department of Physics**
- W. Patrick Arnott  Mathematical Physics
- Bruno Bauer  Experimental studies of plasma waves and instabilities
- Andrei Derevianko  Theoretical physics
- Andrew Geraci  Atomic and microelectromechanical physics
- Roberto C. Mancini  Theory and modeling of laser-produced transient plasmas
- Hans Moosmüller  Atmospheric and aerosol physics
- Alla Safranova  Theoretical plasma physics
- Timur Tscherbul  Theoretical atomic and molecular physics
- Jonathan Weinstein  Ultracold atomic and molecular physics

**Department of Chemistry**
- Mario A. Alpuche  Electrochemical methods for energy conversion
- Sean M. Casey  Semiconductor surface science
- Kent M. Ervin  Cluster ion reactions and photophysics
- David M. Leitner  Theoretical chemistry, biophysical chemistry
- Samuel Odoh  Computational materials chemistry
- Matthew J. Tucker  Ultrafast spectroscopy, biophysical chemistry
- Sergey Varganov  Electronic structure theory and molecular dynamics
1.6 Graduate Advisory Committee

After a student has chosen a research advisor, he or she should consult with the advisor to form a Graduate Advisory Committee. The student should be prepared to suggest members for the committee which must have at least five members: two from each of the chemistry and physics departments (including the research advisor), and one from an outside department.

The student initiates the paperwork necessary to form this committee and the research advisor acts as its chairman. The committee is responsible for formally approving the student’s program of study and for administering the Oral Comprehensive Exam and the Final Oral Examination upon the completion of the research dissertation. The appointment of this committee should be accomplished no later than the beginning of the student’s third semester at the university.

1.7 Program of Study

Students admitted to graduate standing must have their initial course work approved by the Graduate Advisory Committee. An approved Program of Study must be submitted to the Graduate School no later than the completion of 24 graduate credits.

The Graduate Advisory Committee should be convened by the research advisor to discuss the student’s proposed program of study. Generally, the student and advisor work together to decide on the courses that will be taken by the student during the graduate program. These courses are selected to fit the student’s vocational objectives and provide background useful for research while at the same time meeting the requirements for the Ph.D. degree (see Section III). The student will need to pick up the Program of Study forms from the Graduate School office in Getchell Library and have these forms filled out prior to meeting with the Graduate Advisory Committee. The student should arrange a suitable time and place for the meeting after consulting with committee members. The committee then meets with the student to discuss and approve the proposed program. As part of this meeting, the student might be asked to give a brief presentation describing his or her proposed research. This helps the committee become better acquainted with the student and allows it to better evaluate the proposed course of study. Completion of the program of study form is required for an RA or TA contract in the second year of study.
2. General Requirements

2.1 Credit Hours
Registration in 9 graduate credits or more each semester is considered full time. The normal course load taken by students who are serving as regular Teaching Assistants is about 9 credits.

2.2 Course Work Performance
Good Standing
- UNR Overall Graduate Course Work GPA of 3.0 or Better

Probationary Status
- UNR Overall Graduate Course Work GPA Balance Below 3.0

Dropped from Graduate Standing
- UNR Overall Graduate Course GPA Balance of 7 or More Grade Points Below 3.0

2.3 Comprehensive Examinations
In addition to the formal course work, written and oral comprehensive examinations must be taken. The written part of the comprehensive examination will be taken by the student within one year of the completion of the 5 required courses in the Chemical Physics program, but can be taken anytime after four of the required courses have been completed. The exam will focus on the material covered by those courses. The Chemical Physics Program Director coordinates the writing of the exam, soliciting problems from those faculty who have recently taught the required courses.

The oral part of the comprehensive examination is taken immediately after completion of the written part (normally within 1-2 weeks) and is supervised by the student’s Graduate Advisory Committee. The oral examination will cover the same broad range of topics treated by the written comprehensive exam and is designed to allow the Graduate Advisory Committee to better evaluate the student’s general background in chemical physics. General questions pertaining to the student’s dissertation research project may also be posed.

Successful completion of both the written and the oral parts of the comprehensive examination will be necessary for the student’s continued good standing in the Chemical Physics program. Unsatisfactory performance on the first attempt at the comprehensive examination may be rectified by retaking both parts of the exam within six months of the first attempt. Comprehensive exam results are acceptable toward fulfilling the Ph.D. degree requirements for a period of 4 years following the end of the semester in which the examination was satisfactorily completed.

2.4 Seminars
Students are also required to participate in the seminar program. This means attending both students’ seminars and seminars presented by visitors to the physics and chemistry departments. All students must give a minimum of 2 seminars (see Sec. 3.4), of which one will function as a “final” seminar delivered upon completion of the dissertation.
2.5 Time Limitation for Completion of Advanced Degrees

All requirements for the doctoral program, excluding prerequisite graduate course work or master’s degrees, must be completed within eight years from the time of admission. It should be noted that the average Ph.D. degree in Chemical Physics should take about five years. Be sure to consult the time limits on comprehensive examinations (Sec.2.3).

Students must register for an appropriate course load at least one semester or summer session each year, or obtain an “approved leave” from the admitting department. Unless these approved leaves are part of the student’s Graduate School records, extensions of the eight year time limitation will not be approved by the Graduate School.

2.6 Admission to Chemical Physics from an M.S. Program

A student wishing to enter the Chemical Physics Ph.D. program while enrolled in a Master’s program in either Chemistry or Physics at UNR must first inform the research advisor of this intention. The research advisor, with the approval of the Chemical Physics faculty, then initiates the necessary paperwork through the Office of the Dean of the Graduate School. This includes adjusting the size of the Graduate Advisory Committee from three to five members. The new committee is then responsible for determining what portion of the Chemical Physics Ph.D. requirements remain to be fulfilled by the student, including both curriculum and comprehensive examination requirements.

For graduate students transferring into the Chemical Physics Ph.D. Program from another institution, without completing a degree at that institution, the Graduate School currently permits a maximum of 9 credits to be transferred. Note that a master’s thesis may not take the place of the Ph.D. dissertation either in whole or in part.

Students wishing to enroll in the Chemical Physics program with a completed M.S. in either Chemistry or Physics (or another subject deemed acceptable by the Chemical Physics admissions committee) earned at either UNR or another institution should apply for the program the same way as a student entering directly from an undergraduate program. The Chemical Physics admissions committee, in accordance with Graduate School regulations, will then determine what portion of the Chemical Physics Ph.D. requirements are transferable and which requirements remain to be fulfilled by the student. The Graduate School current permits a maximum of 24 credits to Note that a master’s thesis may not take the place of the Ph.D. dissertation either in whole or in part.
3. Requirements for the Ph.D. Degree

3.1 Minimum Credit Requirements
The minimum credit requirements for the Ph.D. are listed below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required course credits</td>
<td>15</td>
</tr>
<tr>
<td>Independent Studies (CHEM 793 or PHYS 792):</td>
<td>12</td>
</tr>
<tr>
<td>Seminal 1</td>
<td>2</td>
</tr>
<tr>
<td>Electives 2</td>
<td>18</td>
</tr>
<tr>
<td>Comprehensive Exam (CHEM 795):</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL Course Credits:</td>
<td>48</td>
</tr>
<tr>
<td>Dissertation Credits:</td>
<td>24</td>
</tr>
</tbody>
</table>

TOTAL CREDITS: 72

1 A minimum of two (2) seminar credits must involve an original oral presentation by the student.
2 May include up to eight (8) credits of CHEM794 (“Physical Chemistry Colloquium”) and up to three (3) credits of PHYS799 or CHEM 799 (“Dissertation”)

3.2 Comprehensive Examinations
Students must achieve satisfactory performance on the written and oral comprehensive examinations, as determined by the Comprehensive Examination Committee and the Graduate Advisory Committee, within one year of completing the required courses. Failure on the first attempt of either the written or the oral examination may be rectified by taking the examination within six months of the failure. (See Sec. 2.3 for a description of the written and oral parts of the examination.)

Comprehensive exams are acceptable for a period of 4 years for the Ph.D. degree following the end of the semester in which the comprehensive examination requirement was fulfilled. (See Sec. 2.3) Students should enroll in CHEM 795 (1 credit) during the semester they take their comprehensive exam.

3.3 Language Requirement
The Chemical Physics program does not require a foreign language.

3.4 Seminar Requirements
Students are expected to give their first seminar no later that their third semester in graduate school. The first seminar is given on a literature topic chosen from a list provided by the chemistry faculty if the student is enrolled in CHEM790, or is chosen by the student in consultation with the research advisor if the student is enrolled in PHYS790. A “B” is the minimum acceptable grade for satisfying the seminar requirement. Students should consult with the faculty member in charge of either CHEM790 or PHYS790 to get an idea of what is expected. Also students should carefully consult the “Seminar Guidelines” available in the chemistry department office.

The second student seminar is the final public presentation of the Ph.D. research, which is to be given on the same day as the Final Oral Examination, just before the examination.
3.5 Admission to Candidacy

The student should apply for admission to candidacy after passing the comprehensive examination. The student must initiate this procedure using forms obtained from the Graduate School and should submit the application for admission to candidacy no later than eight calendar months before the date of graduation. Consult the University Catalog for further details, especially concerning the time limit on Candidacy.

3.6 Approval of Dissertation and Final Oral Examination

After completion of a dissertation, the student is required to discuss it and defend it to the Graduate Advisory Committee. Consult the University Catalog for information about the required dissertation format, dates of submission, number of required copies, etc. A draft of the dissertation should be given to members of the examining committee (Graduate Advisory Committee prior to the final typing so that corrections and suggestions can be incorporated. The completed, unbound dissertation must be submitted to the committee at least one week before the final examination. The meeting in which the dissertation and related topics are discussed is the Final Oral Examination. Consult the University Catalog for other details.
4. Graduate Student Evaluation Procedures

Graduate students in the Chemical Physics program are evaluated yearly by the Chemical Physics faculty to assess progress toward completion of requirements, including especially research. The purpose of these evaluations is to determine the candidate’s overall fitness for his or her chosen program. In addition, the evaluations should bring out any areas of unsatisfactory progress so that the student can be aware of them and correct them.

Included in this brochure is a Self-Evaluation Record and a Timetable of Events and the GS A-1 form from the Graduate School. The Self-Evaluation Record is intended to provide information about completed course work and comprehensive exams.

The timetable is a schedule of times for completion of the requirements for the Ph.D. degree within four to five years, and is intended as a guide to the faculty in measuring progress. It should be noted that the Timetable is meant to be an appropriate time schedule of events – a goal to aim for – and not a schedule of firm deadlines for the completion of the requirements. It is recognized that it may not be possible to adhere to the schedule because of circumstances such as difficulty in scheduling classes, entering the program with deficiencies, etc. However, serious deviation from the schedule may be an indication of unsatisfactory progress.

The GS A-1 form describes the steps to be followed in pursuing a graduate degree program.
5. Timetable of Events

For students in the Ph.D. program entering with a Bachelor’s Degree, this section gives a recommended schedule for a four to five year program. The schedule appropriate for students entering the program with a Master’s degree will vary from individual to individual depending on the Chemical Physics requirements that are fulfilled by the student’s record in a Master’s program. Students falling in this category should consult with the research advisor or the director of the Chemical Physics program for a corresponding timetable of events.

1. First Year of Study
   The following must be accomplished by the end of the first year of graduate study:
   
   (a) Take registration examination before registration.
   (b) Choose a research director by the end of the second semester and develop a graduate program in consultation with the Graduate Advisory Committee before the beginning of the third semester.

2. Second Year of Study
   The following should be accomplished by the end of the second year of graduate study:
   
   (a) Present first seminar by the end of the third semester.
   (b) Complete the required course work (if scheduling permits).

   Along with the completion of these requirements, some definite progress in dissertation research should be made by the end of the second year.

3. Third Year of Study
   The comprehensive examinations must be taken within one year after completion of the required courses. Application for admission to candidacy should be filed soon after the comprehensive examination has been passed and other degree requirements have been completed. By the end of the sixth semester, the student has ideally spent two summers, one or two semesters fully, and two semesters partly on the dissertation research. Thus, significant progress in research work should have been made by this time.

4. Fourth and Fifth Years of Study

   The completion of research and writing of the dissertation should be made during the fourth and fifth years. The final oral examination should be completed shortly after the dissertation has been written. This examination should be completed not later than the end of the fifth year.
SELF EVALUATION RECORD: CHEMICAL PHYSICS PROGRAM

Name: ___________________________________________________________

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
<th>Date Completed</th>
<th>Grade</th>
</tr>
</thead>
</table>

**Required**

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**Elective**

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COMPREHENSIVE EXAMINATIONS

- Completion of Written Exam: _______________________ date
- Completion of Oral Exam: _______________________ date

SEMINAR EXAMINATIONS

- Completion of First Seminar: _______________________ date
- Completion of Second Seminar: _______________________ date