

REQUIREMENTS FOR CHEMISTRY GRADUATE STUDENTS

(supplement to the requirements enumerated in the Graduate Catalogue)

I. Placement Exams

Prior to registration, new graduate students in chemistry will be given examinations in analytical, inorganic, organic and physical chemistry for placement purposes. The level of each of these examinations will be essentially that of the final exam in a good, solid undergraduate course in analytical, inorganic, organic or physical chemistry. The results of these examinations and the extent of your undergraduate course work will be used to determine the academic program of the student.

A student receiving a failing grade on an exam has two mechanisms for rectifying the deficiency: 1) Audit (or take for credit, if appropriate) the recommended course and receive a grade of B- or better, or 2) re-take the failed exam and receive a passing grade. The generally recommended courses are:

Analytical	--	Chem 221
Inorganic	--	Chem 231
Organic	--	Chem 241
Physical	--	Chem 161 or 162

If the student enrolls in the recommended course during the first semester and does not receive at least a grade of B-, the failed placement exam must be re-taken and passed by the end of the second semester. If the recommended course is offered only during the second semester (Chem 221, for example), the student may opt to re-take the placement exam before the start of the second semester. In either case, the student will only have one opportunity to re-take and pass any of the placement exams he/she initially failed. **All placement requirements must be completed by the end of the student's second semester in order to continue in the program.**

(a) Ph.D. Qualifying Requirements

All students pursuing the Ph.D. degree must satisfy the above requirements in all four areas of chemistry -- there will be no exceptions or appeals to this requirement.

(b) M.S. Qualifying Requirements

All students pursuing the M.S. degree must satisfy the above requirements in at least three of the four areas of chemistry -- one of those areas must be the area of specialization of the student. Should the student not pass the placement exam in the 4th area, he/she must demonstrate minimum competency in that area by auditing or taking for credit the recommended remedial course and receiving at least a grade of "C". There will be no exceptions or appeals to this requirement.

II. Course Requirements

Students normally take two to three semesters of formal course work, although this could be longer in some areas (e.g., physical chemistry) that may require a more extensive background in related disciplines. The normal course load is 10 semester hours. In graduate-level coursework, a 3.25 average must be maintained for a Ph.D. and 3.00 for the M.S.

A departmental requirement for all Ph.D. students in the Department of Chemistry is a minimum of one course (2 or 3 credits) of advanced level work in each of 3 out of 5 areas -- only one of these may be a 2-credit course. The requirement for M.S. students is one course in 2 out of the 5 areas. Listed below are the only courses that will satisfy the distribution requirements. To satisfy these requirements, a grade of B- or better is necessary in those courses taken for distribution.

<i>Analytical</i>	Chem 222, 223, 224, 225, 226, 227, 228
<i>Inorganic</i>	Chem 231, 234, 236, 237, 238
<i>Organic</i>	Chem 241, 242, 251, 253, 257, 258, 342, 344
<i>Physical</i>	Chem 262, 264, 265, 266, 267, 268, 363
<i>Related Science</i>	Bioc 301 or 302, Chem 205, 206, 214

Each division also requires students pursuing a degree in their major area to take specific upper-level graduate courses as follows:

<i>Analytical</i>	Chem 222 plus two advanced courses chosen from the Analytical offerings (Chem 223, 224, 225, 226 or an approved 227/228 offering). Students must at least audit (in a satisfactory manner) a 3rd advanced Analytical course. M.S. students must take Chem 222 plus one of the Core courses.
<i>Inorganic</i>	Chem 231, 234, and 236 (Ph.D.); 231, and either 234 or 236 (M.S.).
<i>Organic</i>	Chem 241, 242, and 251 (Ph.D.); 241 and 242 (M.S.).
<i>Physical</i>	Chem 262, 263, and 264 (Ph.D.); 262, and either 263 or 264 (M.S.)

If a specific required course is not offered during the student's stay at UVM, then a suitable substitute course must be arranged for by petition to the Graduate Standards Committee.

Graduate courses outside the department may also be counted towards the 75 credit hours required for the Ph.D. degree and are often desirable in areas that are interdisciplinary in nature (e.g., medicinal chemistry, solid state chemistry, chemical physics, etc.). The exact program of courses is worked out in consultation with the student's research director and the student's studies committee (see Section IV). NOTE: Following completion of all credit requirements (i.e., 75 credits for Ph.D.), students should only enroll for Continuing Registration.

III. Choosing a Research Advisor

Early in the fall semester (early October, typically), the faculty present a series of short talks which describe their research interests. Students should attend all of these talks and then discuss specific research problems on an individual basis with the faculty members. Students are strongly encouraged to discuss research with several members of the chemistry faculty and not to restrict

themselves to one area. A *written* letter indicating your 1st and 2nd choice of research director should be submitted to the Department Chair by the end of the first semester.

IV. Graduate Studies Committee

During the second semester of their first year, students assemble a Studies Committee; this committee will form the nucleus of the student's research proposal and dissertation/thesis defense committees (see Sections VII and VIII, respectively). This committee should be chosen in consultation with the student's research advisor and shall consist of the research advisor and two additional faculty members, one of which must be outside the student's major area. Another member, either external or internal to the Department, may be added to the Studies Committee, if deemed appropriate. The Graduate Standards Committee must be notified, in *writing*, of the composition of the committee as soon as it has been established.

The purpose of this committee is many-fold, but generally serves as an "extended research director". The committee members should be viewed as resources who may be consulted regarding research or academic questions. This Committee is charged with evaluating the student's Chemical Investigations seminar (see Section V) at the end of the second semester. The Committee will initially meet with the student at the end of the student's first year and thereafter at least once a year. Prior to each meeting with the committee (except the first meeting), the student will provide the committee members with a five to ten page written summary of his/her research activity.

At the end of their second year, all students will have their record reviewed by their studies committee. The evaluation will take into consideration the student's placement results, course work, cumulative examinations, graduate seminars, and research progress. Based on this evaluation, the committee will recommend that the student either be: (1) dismissed from the graduate program; (2) asked to complete a Master's degree; (3) accepted into the Ph.D. program pending successful completion of additional requirements (specified by the committee); or (4) accepted into the Ph.D. program. The student's Studies Committee will notify the Graduate Standards Committee, in writing, of the results of their review. Recommendations for dismissal will be discussed and voted on by the entire chemistry faculty and acted on accordingly.

Hereafter, on a yearly basis, the Studies Committee will write a letter of review to the Graduate Standards Committee, after its meeting with the student. It is the responsibility of the student to schedule a suitable time to convene a Studies Committee meeting at which all its members will be able to be present.

V. Graduate Seminars

In the spring term of the first year, all graduate students (both M.S. and Pd.D. candidates) sign up for Chem 382 (1 credit). This entails a presentation of a short seminar (ca. 30 minutes) to students and faculty in their division as well as faculty on the student's Graduate Studies Committee (see Section IV). The seminar is given in August and should be an oral presentation of the proposed research project begun during the spring semester. The chemical investigations seminar will be given a grade of either Satisfactory (S) or Unsatisfactory (U) by the faculty in the student's division and the Studies Committee.

The chemical investigations seminar serves as a mechanism for insuring that the student is in a strong position to obtain significant results and has embarked on a research trajectory that will lead to an advanced degree.

In the fall term of the second year, all graduate students (both M.S. and Ph.D. candidates) sign up for Chem 381 (1 credit) and present a seminar to the department. The topic of the seminar is chosen from the literature and must be approved by the seminar coordinator. A 300-word abstract with annotated bibliography is to be distributed to the faculty at least one week in advance. The seminar will be graded on a scale of A B C F -- a grade of "F" on any seminar will require that it be repeated no later than the following term. The topic of the repeat seminar will be chosen in consultation with the graduate seminar coordinator. Prior to successful completion of the repeat seminar, the student will be awarded a temporary grade of XC (extended credit).

Lastly, all Ph.D. students must also give an oral presentation of their research at a national or regional, professional meeting.

VI. Cumulative Exams

Beginning in the second semester of the first year, students begin taking cumulative exams in their major area. Cumulative exams are designed to insure a sufficient familiarity with the student's major area. The content of these exams vary from area to area but generally require a knowledge of basic principles and current literature. Specific details for each major area follow.

Analytical Monthly exams (September - May), graded pass-fail. Three passes are required for M.S., six for Ph.D.

Inorganic Exams are given approximately monthly during the calendar year, graded on a scale of 0 to 4. Students must obtain a minimum total score of 12. M.S. students must obtain a score of 6.

Organic Ten exams during the calendar year, graded on a scale of 0, 1, 2. Ph.D. students must accumulate five grades of 2 by the end of their graduate program -- 10 points (in any combination) must be accumulated by the end of the second year. M.S. students must accumulate 5 points (including at least one grade of 2) by the end of their graduate program.

Physical Option A: Monthly exams (September - May), graded pass-fail. Six passes are required for Ph.D. and three for M.S. students. Or Option B: Pass four Ph.D. advanced courses relevant to Physical Chemistry for Ph.D. students and two for M.S. students (at least half of these courses must be taken outside of the Chemistry Department, and these courses cannot also be used to satisfy the course requirements outlined in Section II). Students may also pass the cumulative exam requirement by satisfying 50% of Option A and 50% of Option B.

Failure to satisfy these requirements will be grounds for dismissal from the graduate program. Students pursuing the M.S. degree must have completed all non-thesis requirements by the end of their third year in the program.

After completion of the cumulative exam requirements, the student must enroll in either Grad 497 (Ph.D.) or 397 (M.S.) -- these are no-credit courses required by the Graduate School which indicate that the student has satisfied the graduate comprehensive examination requirement. Prior to enrollment in these courses, the Graduate Standards Committee must be notified.

VII. Research Proposal: Advancement to Candidacy

All Ph.D. students must register for Chem 388 (Research Problem Conception and Solution -- 1 credit) during their 5th semester (first semester of the third year). Under no circumstances can the course be completed later than the 6th semester.

The research proposal consists of a written formulation of a research problem and methods of solution not directly related to the student's research area. The proposal is presented orally to the Department as well as to the Studies Committee, which now has been expanded to include one additional faculty member outside the Department, chosen by the student in concert with his/her research advisor. The student's research advisor is a non-voting member of the Research Proposal Committee.

Prior to finalizing the topic of the proposal, the student must complete the selection of his/her committee and receive approval of the topic from all committee members. In the event that any members of the committee have reservations about the suitability of the topic, the committee shall meet to resolve these differences and report back to the student so that the topic may be modified as needed. No later than one month prior to the oral presentation/exam, the student shall distribute an outline of the proposal to his/her committee members for approval -- any serious reservations by a committee member will be resolved, again, by a meeting of the committee. At least two weeks before the oral presentation/exam, the student will distribute copies of the written proposal to all committee members. After the student's oral presentation and after the committee has finished questioning the student, the committee meets privately to discuss the student's performance -- the committee may pass or fail the student on either the written or oral components of the proposal and may recommend that the student rectify specific deficiencies through additional written or oral requirements. Successful completion of the research proposal is recorded by a grade of Satisfactory (S) in Chem 388 and the student will then be considered a candidate for the Ph.D. degree.

When planning for the research proposal, the student should keep in mind the philosophy behind it. The research proposal should not be viewed as a literature search or an additional graduate seminar -- the bulk of the student's effort, both written and oral, should be devoted to proposing and solving a chemical problem. Evaluation by the faculty will center upon the validity of the problem and the scientific viability of the proposed solution. The length of the written proposal should be kept to a maximum of 3000 words plus figures and references and should present background sufficient to define the problem as well as a reasonably detailed presentation of the methodology proposed to solve it. Students should be prepared to deal with any questions which relate to the both the oral and written presentations of the proposal -- NOTE: chemistry is a cumulative science, so it is assumed that advanced concepts and techniques introduced in the proposal are backed by a solid fundamental understanding of the underlying material (i.e., it is highly likely that the student will be asked some questions of a fundamental nature during the oral exam).

VIII. Dissertation/Thesis Defense

For both the Ph.D. and M.S. degrees, students are required to write and defend their work. For the semester in which the student intends on defending his/her thesis, he/she must enroll in Grad 499 (Grad 399 for M.S.); this is a no-credit course required by the Graduate School for graduation. Before the student begins writing his/her thesis, the thesis committee must have been formed. The Ph.D. thesis committee is the expanded Studies Committee (see VII). The student's research director has the option of requiring additional members, if s/he deems it desirable. A detailed outline of the thesis is then presented to the committee for their suggestions. The outline is subsequently modified, if necessary, by the student. The dissertation/thesis is presented to the Committee members two weeks prior to the date of the oral defense. Just prior to the defense, the student will present a formal public seminar on his/her work. The student then meets with his/her committee for the actual oral defense.

IX. Financial Support

During the academic year, graduate students typically receive financial support either in the form of a teaching assistantship (T.A.) from the chemistry department or a research assistantship (R.A.) from their research director's grant. Graduate students will automatically be considered for T.A. support by the department through either their fifth year (Ph.D.) or second year (M.S.) in the program; T.A. support for third-year M.S. candidates will be considered on an individual basis. Note that while summer support is not guaranteed, it is unusual for a student not be appointed to a T.A. or R.A. during the summer months. All support, of course, is dependent upon the student's satisfactory performance both as a T.A. and in his/her research.

X. Suggested Time-Table for Graduate Requirements

NOTE: The student is responsible for documenting their progress through the program by keeping their Graduate Record Progress (GRP) form up to date.

YEAR ONE - 1st Semester

- Placement Exams
- Coursework: Distribution/Placement Requirements
- Choose Research Director and begin graduate research

YEAR ONE - 2nd Semester

- Coursework: Distribution/Placement Requirements
Seminar (CHEM 382)
- Satisfy Placement Requirements
- Form Graduate Studies Committee
- Begin taking Cumulative Exams

YEAR TWO - 1st Semester

- Coursework: Distribution/Core Requirements
Seminar (CHEM 381)
- Continuing Requirements: Cumulative Exams

YEAR TWO - 2nd Semester

- Coursework: Distribution/Core Requirements

- Continuing Requirements: Cumulative Exams
- Evaluation by Graduate Studies Committee
- Choose committee for Research Proposal

YEAR THREE - 1st Semester

- Coursework: Distribution/Core Requirements
- Continuing Requirements: Cumulative Exams (FINISH)
(Enroll in GRAD 497)
- Write and defend Research Proposal (CHEM 388)

YEAR THREE - 2nd Semester

- Coursework: Distribution/Core Requirements (FINISH)
- Dissertation Research

YEARS FOUR - ???

- Finish Research for Dissertation; Thesis Defense (GRAD 499)