

HANDBOOK FOR DOCTORAL STUDENTS IN CHEMISTRY

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**THE CITY UNIVERSITY OF NEW YORK
THE GRADUATE SCHOOL AND UNIVERSITY CENTER
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The following pages contain the procedures and requirements of the Ph.D. Program in Chemistry of The City University of New York. While we have tried to be as accurate as possible, undoubtedly errors of omission or fact have crept into the preparation in spite of our efforts. Should you notice any, please call them to our attention.

The information contained in this *Handbook* is current as of August 2005 and is supplementary to the information and regulations contained in the *Graduate Center Bulletin*, *Student Handbook*, and Bylaws and Governance document of The Graduate School and University Center.

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*The Appendix is not printed here. The forms and documents listed are available in the Chemistry office and at the Chemistry program's website (<http://web.gc.cuny.edu/chemistry/handbook>). Students are urged to use the website to print forms when they are needed, obtain the required signatures, and return them to the Chemistry office.

I. INTRODUCTION

The degree of Doctor of Philosophy (Ph.D.) is awarded for mastery of the subject matter in a particular discipline and demonstration of the ability to do independent research. The production of an acceptable doctoral dissertation based upon original research carried out by the student is the distinguishing characteristic of the Ph.D. degree.

Mastery of subject matter is demonstrated by the satisfactory performance of the student in courses and on examinations. The specific course and examination requirements of the CUNY Ph.D. Program in Chemistry are described in this *Handbook*.

Research culminating in the doctoral dissertation is carried out under the direction of a research mentor. The selection of a research mentor should be made before the end of a student's second semester in the program. The general course of study in the Ph.D. program involves a transition by the student from course work and examinations early in the program to a full-time commitment to the research project as study continues.

This *Handbook* contains detailed information about the CUNY Ph.D. Program in Chemistry. Students should also become familiar with the *Bulletin* of The Graduate Center and the *Student Handbook*, which is issued annually by the Vice President for Student Affairs. The brochure "Doctoral Study in Chemistry" contains descriptions of the research interests of the faculty and is useful in the selection of a research mentor.

II. STRUCTURE OF THE PH. D. PROGRAM IN CHEMISTRY

The CUNY Ph.D. Program in Chemistry was established in 1962. The faculty members of the Ph.D. program are drawn primarily from several senior colleges of the City University: Brooklyn College, City College, Hunter College, Queens College, and College of Staten Island. Applicants to the Ph.D. Program in Chemistry are asked to select one of these colleges as the location at which they intend to carry out their doctoral research.

Lecture courses and seminars are generally given at The Graduate Center. Laboratory courses are given at the various colleges. Doctoral research is also carried out at the colleges.

1. **Subdisciplines**

A. The program has seven subdisciplines: Analytical, Inorganic, Organic, Molecular Biophysics, Nanotechnology and Materials, Physical, and Polymer. The faculty of each subdiscipline elect a subdisciplinary chair to a two-year term of office.

B. The subdisciplinary chairs recommend to the Executive Officer faculty to teach courses and arrange for the administration and grading of examinations in their subdiscipline. Results of student performance on first and second examinations are presented by the subdisciplinary chairs to the Executive Committee for its consideration.

C. Each subdisciplinary chair is available to students to offer advice and information concerning specific subdisciplinary requirements.

D. The faculty of each subdiscipline decide whether or not to have a Steering Committee for that subdiscipline, to consist of members elected by the faculty in that subdiscipline for two-year terms. Each Steering Committee includes a student member from that subdiscipline, elected by the students in that subdiscipline for a one-year term.

2. **Executive Committee**

A. The Executive Committee is comprised of:

- (1) the Executive Officer;
- (2) the elected chairs of the campus chemistry departments fully participating in the Ph.D. Program in Chemistry;
- (3) the elected faculty representative(s) to the Graduate Council;
- (4) the five elected subdisciplinary chairs;
- (5) a representative elected from and by each fully participating college that does not have two of its members from the above on the Executive Committee;
- (6) the elected representative(s) to the Doctoral Students' Council and the elected student representative(s) to the Graduate Council.

B. The Executive Officer is appointed by the President of The Graduate Center for a term not exceeding three years, and may be reappointed.

C. The Executive Officer presides at meetings of the program's faculty and Executive Committee, and serves as chair of the program's standing committees on Faculty Membership and Admissions and Awards.

D. In general, student participation in matters before the Executive Committee and the standing committees is deemed inappropriate when the matters involve judgment of:

- (1) the academic performance of students, or

(2) the professional competence of doctoral faculty.

In cases where there is no agreement on the propriety of student participation in an Executive Committee or standing committee deliberation, the Executive Committee or standing committee, respectively, votes as a whole to decide the question.

E. The Executive Committee calls at least one meeting per year of the faculty, at which the Executive Committee presents a report; a quorum at this meeting consists of 25 persons or 50 percent of the faculty, whichever is smaller.

F. The Executive Committee calls a meeting at least once a semester with the students in the program.

G. The procedures of the Executive Committee and its standing committees are governed by *Robert's Rules of Order, Newly Revised*, in all cases in which they are applicable.

3. Standing Committees

A. The Faculty Membership Committee is comprised of the members of the Executive Committee. The Faculty Membership Committee is responsible for review of continued membership of each faculty member on the doctoral faculty, and for nomination to the Provost of members of the doctoral faculty in Chemistry. The criteria for nomination include a determination that the prospective faculty member will make a significant contribution to the needs of the program, and evidence of:

- (1) significant research relevant to the Ph.D. Program in Chemistry;
- (2) qualification to teach a doctoral course in Chemistry or provide other doctoral-level training; and/or
- (3) qualification to supervise doctoral dissertations or other graduate-level research.

B. The Curriculum and Examinations Committee is comprised of the subdisciplinary chairs and one student member elected for a one-year term by the students program-wide. The Curriculum and Examination Committee reviews curriculum, submits curriculum recommendations to the Executive Committee, and recommends to the Executive Committee procedures and standards for the conduct of examinations.

C. The Admissions and Awards Committee is comprised of the members of the Executive Committee. The Admissions and Awards Committee recommends admissions and awards procedures and standards for the program.

D. The Elections Committee consists of three faculty members and three students, each appointed for a two-year term by the Executive Officer in consultation with the Executive Committee.

(1) The Elections Committee solicits nominations program-wide for faculty representative(s) to the Graduate Council (two-year term) and student representative(s) to the Graduate Council (one-year term), and supervises the conduct of these elections. Only faculty members vote for faculty representatives, and only students vote for student representatives. All Chemistry doctoral faculty members and all matriculated Chemistry doctoral students are eligible to vote and are eligible for election. The Elections Committee notifies, through the Executive Officer, the doctoral faculty of each fully participating college that does not have two of its members on the Executive Committee of the need for the election of a faculty representative to the Executive Committee.

(2) The Elections Committee solicits nominations from the faculty within each subdiscipline for election of the chair of that subdiscipline and supervises the conduct of this election.

(3) The Elections Committee solicits nominations from the matriculated students program-wide for election of a student representative to the Curriculum and Examinations Committee and supervises the conduct of this election.

(4) The Elections Committee solicits nominations from the students within each subdiscipline for election of a student representative to the subdiscipline's Steering Committee, if one exists, and supervises the conduct of this election.

(5) Elections take place in the Spring semester before April 1. All new terms of office commence in the Fall semester.

(6) All elections are by mail ballot.

III. STUDENT ADVISEMENT

The Executive Officer is responsible for the overall administration of the Ph.D. Program in Chemistry. The Executive Officer can be contacted at the office of the Ph.D. Program in Chemistry at The Graduate Center, Room 4310. Entering students will meet with the Executive Officer to select courses for their first semester. Thereafter, students will generally meet with the Executive Officer at least once each semester for registration and advisement. Students are encouraged to consult the Executive Officer for advice or information about any aspect of the Ph.D. Program in Chemistry as the need arises.

Financial support for an entering graduate student usually includes a teaching assistantship. A student's teaching assignment each semester is at the college the student selects for doctoral research. Before the beginning of each semester, students must meet with the chair and/or graduate deputy chair at their college to discuss their teaching assignment.

Subdisciplinary chairs are available for student advisement concerning examinations and other requirements of their subdiscipline.

Useful contact information is given below.

EXECUTIVE OFFICER

Graduate Center

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IV. COURSE AND EXAMINATION REQUIREMENTS

1. Official Course Listing

The complete list of courses and course descriptions is given in Appendix A. The 70000 courses include five courses that are taken by most students (71000, 75000, 76000, 78000, and one of the following: 79001, 79002, 79003, 79041, or 79051). Other 70000 courses are required by particular subdisciplines. Courses in the 805XX series are seminar courses.

79500, 81000, and 90000 are research courses. Only first-level students may register for 79500. Students register for 81000 after selecting a research mentor and successfully completing the First Examination (see below). 90000 is taken only after being advanced to candidacy.

The remaining courses in the 80000 series are advanced courses and special topics courses. Students must have completed all their 70000-level requirements or have the permission of the instructor and the Executive Officer to register for 80000 courses. Grading in these courses is sometimes on a pass-fail basis. Many 80000 courses are given based upon student demand. If you are interested in having a particular course offered, contact the Executive Officer or the appropriate subdisciplinary chair.

2. First-Level Courses and Examinations

Three lecture courses that have a First Examination requirement are:

Chem. 71000 Advanced Inorganic Chemistry	3 credits
Chem. 75000 Advanced Organic Chemistry I	3 credits
Chem. 76000 Introduction to Quantum Chemistry	3 credits

The First Examination in each course consists of the final examination in that course and, in some cases, additional questions approved by the relevant subdiscipline. The course grade is determined by the instructor based on all the course requirements including the final examination. The First Examination (the final examination plus any additional questions) is graded by the course instructor and also by an independent second grader or graders selected by the subdisciplinary chair. The results of the grading of the three parts of the First Examination and recommendations concerning student performance are presented by the subdisciplinary chairs to the Executive Committee for its consideration.

First Examinations are graded on the basis of high pass, pass, conditional pass, and fail. The Executive Committee makes the final determination of a student's grade on each part of the

First Examination. To be certified as having passed the First Examination requirement, a student may have at most one conditional pass, which may not be in the subdiscipline in which the student intends to specialize. If any one of the three parts of the First Examination is failed, that particular examination must be repeated in the following semester. It is usually recommended that the student repeat the appropriate course in the following semester to prepare for this examination.

The Executive Committee will evaluate the progress of every student on the First Examination at the end of each semester. Satisfactory progress generally means passing all three parts of the First Examination during the first year, although in some cases a third semester might be necessary to complete the First Examination. Based on the decisions of the Executive Committee, the Executive Officer will inform the students each semester of their results on the examination and advise students of any other recommendations made by the Executive Committee. A student must make satisfactory progress on the First Examination in order to remain in the Ph.D. program.

The First Examination was restructured for students beginning their studies in Fall 2003 and subsequent semesters. Students must take the First Examination course and obtain at least a full pass on the First Examination in one of the three First Examination courses (71000, 75000, or 76000). Students in the analytical, molecular biophysics, nanotechnology and materials, and polymer subdivisions can choose any of the formerly required First Examination courses as their required course, or have the required course assigned by the subdiscipline based on their interests and goals. Students in the inorganic, organic and physical subdisciplines must take 71000, 75000, and 76000, respectively, as their required course. Students will take Qualifying Examinations in the two remaining First Examination courses. A pass on a Qualifying Examination allows a student to “test out” of the corresponding First Examination course. For example, the required course for a student of the physical subdiscipline is 76000. A physical student who passes the Qualifying Examinations in inorganic and organic chemistry would not have to take 71000 and 75000. The Qualifying Examinations are prepared by faculty of the inorganic, organic, and physical subdivisions based on standard undergraduate textbooks. The Qualifying Examinations are given during the week that precedes the beginning of the semester. Note that all students must take the Qualifying Examination in organic chemistry because this exam serves as both a Qualifying Examination and placement exam. Students who do not score high enough on this exam will be asked to take an undergraduate course in organic chemistry before taking 75000.

Another 70000 course(s) required of all students is the 7900X or 790XX laboratory course(s) appropriate for their chosen subdiscipline. These courses are offered in the Spring semester at the various colleges: 79001 (Analytical, Physical, and Inorganic) is offered at Brooklyn College or City College on a rotating basis; 79002 (Organic) is offered at City College, Hunter College, or Queens College on a rotating basis; and 79003 (Polymer) is offered at the College of Staten Island. Students majoring in Molecular Biophysics and Nanotechnology and Materials are required to take 79041 and 79051, respectively.

78000, Chemical Information Sources, is offered at City College during the interval between the Fall and Spring semesters.

During the first week of classes, First-Level Exemption Examinations are offered for entering students. If a student passes the exemption exam in his/her required First Examination course, the student is exempted from this course. A physical student who passes the exemption examination in 76000 would not have to take his/her required First Examination course. The exemption examination is optional and is generally only taken by students who feel that their background in a particular area is strong enough to merit exemption from the 7X000 course. There is no penalty for failing an exemption exam.

Exemption from the 7900X or 790XX laboratory requirement may be approved by the Executive Officer if the appropriate subdisciplinary chair determines that a student has previously completed an equivalent course(s) or has sufficiently extensive laboratory experience to merit exemption. Students who would like to be considered for 7900X or 790XX exemption(s) should inform the Executive Officer at least two months before registration for the Spring semester so that their requests can be evaluated by the subdisciplinary chairs in a timely fashion.

3. Other Course Requirements

In addition to the 7X00X or 7X0XX courses required of all students, each subdiscipline requires other courses. The basic requirements of each subdiscipline are:

<u>Analytical</u>	<u>Inorganic</u>	<u>Organic</u>	<u>Physical</u>	<u>Polymer</u>
84903	Any two	75100	76100	73000
84904	additional	75200	77000	83901
	70000 courses			83902

Mole. Biophys.

Nano. & Mat. Chem.

BICM 77000

78500

87901

The usual scheduling of 7XXXX courses is:

Fall: 71000, 73000, 75000, 76000, 75200, 77000, 87901

Spring: 71000, 75000, 76000, 75100, 76100, 78500, 7900X, 790XX

Sample schedules for students in each of the subdisciplines are included in Section IV.5.

Students must complete all of the required courses and must maintain an overall average grade of B or better, that is, a cumulative grade point average (GPA) of 3.0 or higher. When the Executive Committee reviews a student's performance, the student's GPA is considered in addition to progress in course work and First and Second Examination results.

4. **Seminars**

Students must take the appropriate seminar course (805XX) each semester for credit until being advanced to candidacy. After advancement, this course must be taken on an audit basis. The seminars include presentations by students and by invited faculty and outside speakers. Most of the presentations by students are made at the program's Seminar Day and program meeting events, which are held at the end of each semester. The analytical seminar meets monthly with the New York Section of the ACS Analytical Topical Group. Each student is required to present at least two seminars while enrolled in the Ph.D. program. The student's first seminar is on a topic determined by the faculty members directing the seminar in consultation with the student and the student's mentor. The topic must not be closely related to the student's dissertation research project. The last seminar is on the student's thesis research and is generally given when the research project is nearing completion.

One of the purposes of the seminar program is to provide an opportunity for students to gain experience in making professional presentations. Students should consult both their research mentor and the faculty members directing the seminar for advice on seminar preparation and presentation. Students should practice their presentation with their mentor. After the seminar, the student will receive a written evaluation of the presentation by the faculty members in charge of the seminar. The faculty members directing the seminar may ask students attending the seminar to prepare brief written evaluations of the seminar as well. These evaluations will also be given to the student presenting the seminar.

Attendance is required at all seminars scheduled for a student's subdiscipline.

Attendance at other seminars of interest to students is encouraged.

5. Sample Schedules and Second Examination Requirements

The following sections include sample schedules of course work and examinations for students in each of the seven subdisciplines of the Ph.D. Program in Chemistry. These schedules are examples; the actual schedule of any individual student may vary depending on the student's background on entering the program and also on the student's performance in the program. Following these schedules ensures the timely completion of the course and examination requirements of the various subdisciplines.

The schedules are presented for students who enter in the Fall semester. Schedules for the first year usually involve taking two of the required 7X000 lecture courses in the first semester and then taking the third required 7X000 lecture course in the second semester. Some subdisciplines recommend that a second lecture course in the 7XX00 series also be taken in the second semester. The specific order in which the required 7XXXX courses is taken often depends on the student's intended choice of subdiscipline and the student's previous academic background.

For students who enter in the Spring semester and major in Analytical, Inorganic, Organic, Physical, or Polymer chemistry, the major schedule difference is that they usually take the appropriate 7900X course in their first semester instead of their second because it is only offered during the Spring semester. Such students will generally take only one required 7X000 lecture course in their first semester and then complete the required 7X000 courses in their second semester the following Fall.

Any questions that first-year students may have about planning their schedules should be addressed to the Executive Officer. Appointments can be made at any time during the semester. After the completion of the First Examination requirement, questions regarding schedules or course and examination requirements can be addressed to the Executive Officer or to the appropriate subdiscipline chair.

The schedules below do not include the Chemical Information (78000), Advanced Seminar (805XX), and Research courses (79500, 81000, and 90000). These courses were discussed in Sections IV.2, IV.4, and IV.1, respectively. Advanced Seminar and Research are taken as required each semester in addition to the courses listed in the schedules below.

A. Analytical Chemistry

A student wishing to specialize in Analytical Chemistry must pass the required 7X00X courses and complete the First Examination requirement. The required 7X00X courses are Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000), Introduction to Quantum Chemistry (76000), and Basic Laboratory Techniques for Research (79001).

The student must then begin second-level work. This includes three additional courses and a research proposal. One of the second-level courses (84903, 84904, or 84905) is offered each semester on a rotating basis. In order to complete the course work in a timely (and possibly shortest) manner, a schedule such as that below would be appropriate.

First semester: Any two (or three) required 7X000 lecture courses
(71000, 75000, 76000)

Second semester: The remaining (if any) 7X000 required lecture course
and 79001 laboratory course.

Students should also take one of the second-level courses: 84903, Chemical Separations, or 84904, Electroanalytical Chemistry, or 84905, Analytical Spectroscopy, during their second semester of study.

Students are encouraged to start taking cumulative exams this semester.

Third semester: 8490X (84903, 84904, or 84905) and preparation and defense of
research proposal.

Fourth semester: 8490X (84903, 84904, or 84905) and preparation and defense of
research proposal (if not completed during the third semester).

Second Examination

The Analytical Chemistry Second Examination consists of three courses and the preparation and defense of an original research proposal.

1. Analytical Second-Level Courses

The student must obtain an average grade of at least B in the courses: 84903, Chemical Separations, and 84904, Electroanalytical Chemistry and 84905, Analytical Spectroscopy.

2. Research Proposal

An original research proposal in an area outside that of the student's dissertation research must be formulated and defended no later than the semester following completion of the second-level courses. Students who begin taking 8490X courses in their second semester may defend their research proposals during their third semester. The research proposal must have a substantial analytical component. The procedure to be followed is:

- a. The student will submit a project title and a brief description to the Analytical Chemistry faculty no later than a month after completing the second-level course work. The faculty will be requested to provide written comments to the chair of the Analytical Chemistry subdiscipline.
- b. The chair of the Analytical Chemistry subdiscipline will appoint a committee of at least three members to evaluate the topic. The committee will notify the student in writing, through the chair, of its acceptability.
- c. Upon approval of the topic, the student must prepare within two months a 10–20-page typed proposal stating concisely:
 - i) the problem;
 - ii) the significance of the problem;
 - iii) past work related to the problem (literature review);
 - iv) the approach to be taken;
 - v) expected results.
- d. If the committee approves the proposal, the student should prepare to defend it in an oral examination. Proposal defenses are generally held at the end of each semester.
- e. The defense will be open to all faculty. The Analytical Chemistry faculty members who attend the defense will decide whether the student (i) has passed this part of the second examination, (ii) is required to submit specified written modifications of the proposal to the committee for approval, (iii) is required to prepare a second oral defense of the proposal after having addressed the major deficiencies noted by the committee, or (iv) has failed this part of the Second Examination.
- f. The committee members, through the chair, will notify the Executive Committee of their recommendation.

B. Inorganic Chemistry

The required 7X000 courses for an Inorganic Chemistry student are Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000), Introduction to Quantum Chemistry (76000), and Basic Laboratory Techniques for Research (79001). These courses and the First Examination are normally completed during the first year. The Second Examination should begin during the semester following the completion of the First Examination requirement. If the First Examination is completed in the first year, the Second Examination should begin during a student's third semester. Elective courses in the 80000 series may be recommended by a student's

research mentor or thesis committee. A typical course schedule is the following:

First Semester:	71000 and 76000 (or 75000)
Second Semester:	75000 (or 76000) and 79001
Third Semester:	77000 or another 70000 course
Fourth Semester:	76100 or another 70000 course
Fifth Semester:	Recommended 80000 course

Second Examination

The Inorganic Chemistry Second Examination consists of two parts. Part 1 is a series of four exams administered by individual faculty. The exams are usually in oral format, but may be written at the option of the examiner. A preliminary written report is required for each assigned topic. Part 2 is an original research proposal to be defended before members of the Inorganic Chemistry faculty. This is done following the successful completion of Part 1. A typical Second Examination begins early in the Fall of the second year. By about June 15 of the previous Spring, the student will be notified of the faculty examiners and the topics of the four examinations in Part 1. These examinations will then be given at one-month intervals, beginning in September and finishing in December. Within one month of the successful completion of Part 1, the student will submit to the chair of the Inorganic Chemistry subdiscipline an 8–10-page written summary of the original research proposal. The defense of the proposal will take place within one month following receipt of the written proposal. The entire Second Examination may be completed by the end of a student's fourth semester. A more detailed description of Part 1

and Part 2 of the Second Examination follows.

Part 1. Each faculty examiner will select an examination topic of current interest. All the topics will be announced approximately three months prior to the first scheduled examination. The students taking the examination will receive a written statement of each examination topic. This statement will include a list of references and will outline the limits of the topic to be treated in the examination. It is expected that the student will be familiar with the course material of 71000 (and other 70000-level courses) in addition to the references assigned specifically for the examination. A preliminary summary of the topic (about five pages) should be prepared by the student and submitted to the examiner. Upon evaluation of this report, the faculty examiner will determine the exact date and place of the examination in consultation with the students taking the examination.

Students are strongly encouraged to contact the faculty examiner for advice and/or clarification in preparing for each examination. Each examination in Part I is graded on the basis of high pass, pass, conditional pass, or fail. If any one examination is graded fail, an additional topic may be assigned. A student may have at most one conditional pass. The student's overall performance on Part I is evaluated by the chair of the Inorganic Chemistry subdiscipline in consultation with the faculty examiners.

Part 2. Within one month of the successful completion of Part I, the student will submit to the chair of the Inorganic Chemistry subdiscipline an 8–10-page summary of an original research proposal. The summary must contain:

- a. A brief outline of the current literature in the field of the proposal with several key references.
- b. A succinct statement of what is proposed and why.
- c. A short outline of the experimental and/or computational approaches proposed to solve the problem.

In the oral defense of the proposal, the student will be examined by the committee of the faculty, which consists of the chair of the Inorganic Chemistry subdiscipline and at least two other Inorganic Chemistry faculty members. The examination usually consists of a brief summary of the proposal by the student (15–25 minutes) followed by questions from the examiners. Questions from the examiners tend to fall into the following categories:

- a. The student's interpretation of previous work in the area. In practice, this often includes demonstration of competence in 71000 and other course material.
- b. The practicality of the suggested approach to solving the problem.

c. The originality of the proposal.

Students should consult their research mentor and/or the chair of the Inorganic Chemistry subdiscipline for advice on the preparation and defense of a research proposal.

C. Organic Chemistry

An Organic Chemistry doctoral student must take Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I, Physical Organic Chemistry (75000), Introduction to Quantum Chemistry (76000), and Basic Laboratory Techniques for Research in Organic Chemistry (79002). These courses and the First Examination are generally completed in the first year.

Two other 70000-level courses are required of all organic chemistry students: Advanced Organic Chemistry II, Synthetic Organic (75100), and Quantum Organic Chemistry (75200). One of these courses is usually taken in the semester immediately following the completion of 75000.

Two additional courses in the 80000 series must also be taken during the period of a student's research training, one of which must be taken before advancement to candidacy. The second course may be taken on an audit basis after advancement to candidacy. In recent years, 80000 courses have been taught in the following areas: Organometallic Chemistry, Heterocyclic Chemistry, Stereo-chemistry, Natural Products Chemistry, and Organophosphorus Chemistry. These courses are taught by specialists and are intended to provide expertise that may be particularly important to students early in their professional careers. Students will be advised by their research mentor and/or Dissertation Committee regarding such specialized training. If all course work and First Examinations are completed in timely fashion, 80000 courses could be taken as early as a student's fourth semester. A typical course schedule is the following:

First Semester:	75000 and 76000 (or 71000)
Second Semester:	75100, 79002, and 71000 (or 76000)
Third Semester:	75200
Fourth Semester:	80000 course
Fifth Semester:	80000 course

Second Examination

Organic chemistry students must start taking the cumulative examinations no later than the beginning of the semester immediately following completion of the First Examination requirement. Any delay in starting the examinations is not permitted. Students must pass at least seven cumulative examinations given monthly over a maximum of three years. The program is designed to be quite flexible.

Eight cumulative examinations are given each academic year starting in October and are usually scheduled at 10:00 a.m. on the second Friday of the month. Most (but not all) of the examinations are on topics that are announced three or four weeks prior to the examination date. Thus, students take a maximum of 24 examinations of which three at most may be chosen as withdrawals. Students must pass seven of a maximum of 21 “cumes” over a period of no more than three years. Criteria of satisfactory progress are described below.

There are two possible variations on the usual route starting in the third semester of achieving 7 passes out of 21 cumulative examinations taken over three years:

- 1) If in the first semester of study a student earns full passes (no conditional passes) in both the organic and one other First Examination, he or she is allowed but not required to take the second semester cumulative examinations on a “no penalty” basis: examinations passed count, but those failed are not noted on the student’s record. This opportunity is allowed only during the student’s first year of study.
- 2) A student who passes four of the first six cumulative examinations taken may be invited to substitute formulation and defense of an original research proposal (see below) in place of the remaining three cumulative examinations.

A student who wishes to withdraw from a particular examination does so by writing “withdraw” on the front of the examination booklet. Alternatively, if the student does not want to take the time to travel to The Graduate Center, he or she must notify the chair of the Organic Chemistry Steering Committee prior to the examination of his or her decision to withdraw.

Examinations not taken are counted as failures and are entered as such in the student's record. A student will be excused from taking an examination only in exceptional circumstances.

Criteria for Satisfactory Progress

Minimal progress consists of passing at least two cumulative examinations the first year, four by the end of the second year, and seven by the end of the third year. A student who falls below the minimum at any point may be terminated by the program. A student who passes

only one examination during the first year, or only three by the end of the second year will be allowed to continue in the program if his/her research mentor presents a successful appeal on the student's behalf. The appeal must be made in writing and directed to the chair of the Organic Chemistry Steering Committee. The research mentor must give specific reasons for allowing the student to continue in the program. In such a case the Organic Chemistry Steering Committee will consult the student's entire record, obtain the views of the other members of the student's Dissertation Committee, and then make its recommendation in writing to the Executive Officer with copies to the student and to the student's research mentor. The Executive Committee will then decide whether to terminate or retain the student.

Students who pass no cumulative examinations the first year, or no more than two by the end of the second year, will be terminated by the program.

In practice, few students who have entered the cumulative examination program have been terminated for falling below the minimum requirements because the program is quite flexible. It is designed so that students who quickly acquire a working knowledge of the organic chemistry research literature can complete the requirement in short order. Those students who experience serious difficulties are allowed an extended period in which to acquire an understanding of the research literature adequate for qualification at the Ph.D. level.

The Research Proposal Alternative

Because the preparation of research proposals provides excellent training for all research students, the following option is allowed for students who prove their ability early on. Upon the invitation of the Organic Chemistry Steering Committee, and with the approval of the student's research mentor, the student may substitute a research proposal in place of three of the required seven cumulative examinations. This option is never allowed when students experience difficulty in passing the cumulative examinations. It is allowed only in cases in which students have proved their competence in organic chemistry by passing four of the first six taken.

The Organic Chemistry Steering Committee may at its sole discretion extend the proposal invitation to students who do not strictly meet this criterion, but the proposal will never be allowed as a way out for any student who is experiencing difficulty with the cumulative examinations. In other words, students must clearly show their competence in organic chemistry by establishing a strong record in passing the cumulative examinations before the

proposal option is brought up for consideration by the Organic Chemistry Steering Committee.

Research Proposal Rules and Procedures

1. The Steering Committee will appoint a three-member Proposal Examination Committee (PEC).
2. The research proposal may not be related to the student's research, however tangentially, and the student's research mentor may not be a member of the PEC. Meetings of the PEC are, however, open to all members of the doctoral faculty, including the student's research mentor.
3. The student is required to submit his or her proposal within three calendar months of the date that the proposal is invited by the Steering Committee, though a shorter period is strongly encouraged. Four to six weeks should be enough for a capable, hard-working student. Four copies of the proposal must be delivered to the head of the PEC and one copy to the chair of the Steering Committee. If the proposal is judged acceptable for defense, the PEC will set a date and time for the oral defense within four weeks of receipt of the proposal.
4. The PEC may suggest that the proposal be revised or withdrawn if members feel that it would be difficult to defend. The student must then submit a revised proposal within four weeks, with one copy going to the chair of the Steering Committee as before. The PEC will set a date within four weeks for the oral defense of the revised proposal.
5. The student will pass or fail the research proposal by a majority vote of the PEC. The written vote of each member will be given to the chair of the Steering Committee who will deliver it to the Executive Officer.
6. In case of failure, the student will be given the option of submitting a second proposal, or of petitioning the Steering Committee to abandon the proposal option altogether, and resume taking the cumulative examinations.
7. The time spent by the unsuccessful student will be treated as a simple leave of absence from taking cumulative examinations. Because the research proposal option is considered an honor to be allowed only the most successful students (and a way of accelerating their progress through the program), abandonment of the option is unlikely, though possible.

D. Physical Chemistry

A doctoral student in Physical Chemistry must take Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000), Introduction to Quantum Chemistry (76000),

and Basic Laboratory Techniques for Research (79001). These courses and the First Examination are generally taken in the first year. Two other 70000-level courses are also required: Spectroscopy (76100) and Chemical and Statistical Thermodynamics and Chemical Kinetics (77000). The Second Examination consists of a series of cumulative examinations and minicourses as described below. Students must begin the Second Examination no later than the semester immediately following the completion of the required 70000 courses. Elective courses in the 80000 series may be recommended by a student's research mentor or Dissertation Committee. 80000 courses may be taken as early as the fourth semester. A typical course schedule follows:

First Semester:	76000 and 71000 (or 75000)
Second Semester:	75000 (or 71000), 76100, and 79001
Third Semester:	77000
Fourth Semester:	Recommended 80000 course

Second Examination

Students may choose to take both 76100 and 77000 before beginning the Second Examination. Students are encouraged to begin the Second Examination during the semester following the passing of the First Examination. The Second Examination is a series of cumulative examinations and minicourses. The cumulative examinations and the examination for a minicourse are given on the first Friday of each month starting in October.

Each cumulative examination will help a student acquire knowledge in an area of modern physical chemistry that will allow him or her to follow a seminar intelligently and to read a journal article on the topic without necessarily being able to follow all of the details. The topic to be covered and a reading list will be given to each student one month before the examination is given. The reading list will include general material (e.g., review articles or book chapters and journal articles that describe particular examples or applications of the topic).

The minicourse will have four meetings, once a week, for approximately three hours per meeting. The examination will usually be given on the first Friday of the month following the course. Alternatively, the instructor may give a take-home examination. All students are encouraged to take these no-credit courses. The minicourse option is introduced not only as a different way to satisfy part of the Second Examination requirement, but also because few advanced or special topic courses are offered. Recent minicourses include: "Fractals in

Chemistry” and “Oscillating Chemical Reactions.” Students should make the effort to continue to take these no-credit courses after they pass the Second Examination.

Successful completion of the Second Examination in Physical Chemistry requires either passing four examinations within two successive semesters or passing five examinations within three successive semesters. There are two primary grades for a cumulative examination: pass or fail. The instructor may also assign the grades conditional pass or high pass. A grade of conditional pass is not a passing grade. A conditional pass will count as a pass only if it is balanced by a high pass. For example, grades of pass, pass, conditional pass, and pass received during two consecutive semesters do not constitute completion of the Second Examination requirement. Grades of pass, pass, conditional pass, and high pass received during the same period constitute passing the Second Examination.

Students are encouraged to take all cumulative examinations. During the first two semesters of taking exams, however, a student will be excused from one cumulative examination if he or she notifies the subdiscipline chair in writing two weeks before the scheduled date. No

additional

examinations will be excused if a third semester is required to pass the Second Examination.

Students will not be excused from attending minicourses offered as part of the Second Examination.

Students will be informed in writing about their grade on each examination usually within the

two weeks following the examination.

E. **Polymer Chemistry**

Students majoring in Polymer Chemistry are required to take Advanced Inorganic Chemistry (71000), Polymer Chemistry (73000), Advanced Organic Chemistry I (75000), Introduction to Quantum Chemistry (76000), and Basic Laboratory Techniques for Research in Polymer Chemistry (79003). 73000 should be taken as early as possible; a grade of B or better is required for satisfactory progress.

The Second Examination in Polymer Chemistry consists of two second-level courses and a
a
research proposal. The required courses are Advanced Polymer Chemistry I, Structure and Mechanisms in Polymerization (83901), and Advanced Polymer Chemistry II, Characterization and Properties of Polymers (83902). These two courses are offered in alternate Fall semesters.

The research proposal is discussed below.

A typical course schedule is:

First Semester:	73000 and any <u>one</u> of the three required 70000 courses (71000, 75000, 76000)
Second Semester:	79003 and the <u>two</u> remaining 70000 required lecture courses (71000, 75000, and/or 76000)
Third Semester:	83901 (or 83902)
Fourth Semester:	Possible elective
Fifth Semester:	83902 (or 83901)

Second Examination

The Second Examination in Polymer Chemistry consists of three components: two second-level courses and a research proposal. The second-level courses are graded on the scale of A, B, C, and F, which correspond to high pass, pass, conditional pass, and fail, respectively. The research proposal is graded on the scale of high pass, pass, conditional pass, and fail. To pass the Second Examination, a student must earn grades no lower than pass (B) in at least two of the three components of the examination with a grade no lower than conditional pass (C) in the other component.

Polymer Chemistry Second-Level Courses

The two Polymer second-level courses are 83901 (Structure and Mechanism in Polymerization) and 83902 (Characterization and Properties of Polymers). These courses are given in alternating Fall semesters. If a student receives a grade of C, F, INC, or W in one of these courses he/she will be given the opportunity to take an exemption examination to achieve a higher grade. A student receiving a C grade in a course would not be required to take the exemption examination because the Polymer Second Examination can be passed with a C (conditional pass) grade in one of three components. The exemption examination in a course will be given on or before February 20 following the Fall semester in which that course was given. The exemption examination will be a comprehensive examination made up by the instructor(s) who last taught the course.

Research Proposal

The purpose of the research proposal is to initiate training of the student to define and solve scientific problems of current research interest independently. As such, the proposal may not be too closely related to the student's dissertation research. The procedure for satisfying the research proposal requirement is:

1. The student is required to select a topic for the research proposal at the completion of his/her first Polymer second-level course. The proposal is to be based on a journal article selected from any of the following sources:

- a) A list of references provided by the Polymer subdiscipline chair.
- b) A list of references provided by the course instructors of the first Polymer second-level course taken by the student.
- c) An article selected by the student.

The student's choice of paper must be certified by his/her research mentor as not being too closely related to the student's dissertation research. The student then requests final approval of the paper by the subdiscipline chair.

2. A written research proposal (4 copies) is to be submitted by the student to the Polymer subdiscipline chair. The research proposal should include:

- a) A brief overview of the article with a critical evaluation of the results (maximum length of 4 pages excluding references, 1.5-inch line spacing, 12-point font).
- b) A proposed research program to expand upon the findings reported in the article, including an experimental plan to obtain important new scientific information and rectify any defects in the work reported in the article (maximum length of 6 pages excluding references, 1.5-inch line spacing, 12-point font). The research program should include:

- 1) An introduction that states clearly and succinctly the objective(s) of the proposed research program, the significance of the work, and the proposed approach to achieve the objective.
 - 2) Background work that places the proposed program's goals and approaches in perspective with prior work and alternative investigative approaches.
 - 3) The research program's design, describing the techniques and procedures to be used, the anticipated results, and/or how the results will be analyzed.
- c) A summary of the proposal, again expressing the significance of the proposed work and how each portion of the proposal will address the objective(s).

3. The grading of the student's research proposal will be based on the student's ability to express and defend his/her original ideas in writing and in an oral defense. During the oral defense, the student will give a brief presentation (30 minutes maximum) of the research proposal. Students will be examined on the fundamental concepts related to the proposed work and on the feasibility of the proposed work.
4. The schedule for a student to satisfy the research proposal requirement is:
 - a) The student submits the written proposal to the Polymer subdiscipline chair no later than April 1 of the Spring semester immediately following the first second-level course taken by the student. Typically, this will occur during the student's fourth semester.
 - b) The Polymer subdiscipline chair appoints a two-member Proposal Examining Committee (PEC) within one week of receipt of the written research proposal. The student's mentor may not serve on the PEC.
 - c) The PEC takes no more than one month to inform the student whether or not the written proposal is suitable for oral defense.
 - 1) If the written proposal is suitable, the student defends it orally within the next two weeks.
 - 2) If the written proposal is unsuitable for oral defense, the PEC indicates the reasons for its unsuitability in writing (within the one-month period). The student has one month to submit a revised research proposal. The timetable for the revised proposal starts anew at item 4c.
5. After the oral defense of the research proposal, the PEC will transmit its recommendation of a grade to the Polymer subdiscipline chair. In the event that the student is unable to provide a written research proposal suitable for oral defense or the oral defense receives a grade of F, the PEC will give its recommendation on whether the student should receive an opportunity to start the process anew by choosing a different journal article or has failed the research proposal part of the Second Examination. The Polymer faculty will then consider and decide on that recommendation.

F. **Molecular Biophysics**

Students in the Molecular Biophysics subdiscipline must pass the courses and First Examinations in Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000),

and Introductory Quantum Chemistry (U76000) or pass exemption examinations for these courses. Students must take a course in Basic Laboratory Techniques for Molecular Biophysics (79041). In addition, students are required to take Physical Biochemistry (BICM 77000) and Molecular Biophysics (87901). BICM 77000 is offered by the doctoral program in

Biochemistry

during the Spring semester. Students will choose a mentor no later than the beginning of their third semester and form a dissertation committee early during their third semester.

Subdisciplinary advisers may also require students to take an undergraduate course in Biochemistry to prepare for research in Molecular Biophysics.

A typical course schedule follows:

First Semester: 76000, 71000 (or 75000)

Second Semester: 75000 (or 71000), BICM 77000, 79041

Third Semester: 87901

Students with excellent preparation will be permitted to take 79041 in the Fall.

Second Examination

The Second Examination consists of the Molecular Biophysics course (87901) and an original research proposal in an area outside that of the student's dissertation research. This proposal should be defended orally during the fourth semester of study; the grading scale includes high pass (A), pass (B), conditional pass (C), and fail. The average of the grades on the oral defense and 87901 must be no lower than B, and neither grade may be lower than C.

Students who enter the program with advanced course standing must follow an earlier schedule, as determined by the subdiscipline's co-chairs.

The research proposal is designed to initiate training of the student in the independent definition and solution of current research problems in Molecular Biophysics. For this reason, the proposal topic may not be directly related to the student's thesis research. The procedure is described below.

1. The student chooses a lead paper, drawing from readings and discussions in 87901 or 80541 courses, from journal articles provided by the subdiscipline's faculty, or from self-selected journal articles. The student submits a one-page abstract to the subdiscipline's co-chairs within one month after the end of the third semester of study. After consultation with the dissertation adviser regarding suitability of the topic, a decision of approval or disapproval will be made within one week.

2. Once a paper is approved, the student prepares a written proposal. The dissertation adviser may not offer substantial scientific input. Any assistance provided by the dissertation adviser must be limited to advice that promotes organizational skills or increases the student's scientific independence. The written research proposal itself should be submitted in triplicate no later than six weeks after approval, using 1.5- line spacing and 12-point font. It must include the following elements:

- a) A brief overview of the lead article, including a critical evaluation of the results. The maximum length is 4 pages.
- b) A proposed research program to expand upon the findings reported in the article, generate significant new scientific findings, and rectify any defects in the reported work. The maximum length is 6 pages. Include: (1) an introduction stating the problem, the objectives of the proposed program, the significance of the work, and the proposed strategy used to achieve the objectives; (2) a review of the pertinent background literature to place the proposal in perspective and consider alternative investigative approaches; (3) a research design that includes techniques, procedures, and methods for analysis of the results.
- c) A brief critical evaluation of the proposal. Include: (1) a set of expected outcomes that are linked to the objectives or hypotheses of the research design; (2) the potential pitfalls of the design and how they may be addressed. The maximum length is 2 pages
- d) A list of references, including all authors, title, journal, volume, and inclusive pages for each article. References must also be cited at points in the proposal text where they are used; database software is strongly recommended to manage them.

3. The subdiscipline's co-chairs will appoint a two-person Proposal Examining Committee (PEC). The student's dissertation adviser may not serve on the PEC. The PEC will inform the student within two weeks regarding the suitability of the proposal for oral defense. If the proposal is unsuitable, written feedback will be provided and the student will submit a revision within one month. When the proposal is deemed suitable, the PEC will set a date for oral defense within one month.

4. The oral defense allows the student to describe the problem to be solved and the experimental or theoretical procedures to be used in solving it. The student should prepare a 20-minute presentation (including visual aids) and be prepared to answer questions posed by the PEC on issues raised in the proposal.

5. The PEC will transmit its grade recommendation to the subdiscipline co-chairs, who will forward it to the Chemistry Executive Committee. If the oral defense is unsatisfactory, the student will be advised in writing of the deficiencies and asked to address them in written or oral form within one month. A student who fails the defense for a second time will be terminated from the Molecular Biophysics subdiscipline.

G. **Nanotechnology and Materials Chemistry**

The Nanotechnology and Materials Chemistry subdiscipline is a research team-based doctoral program. Students of this subdiscipline must pass the courses and First Examinations in 76000 (Introductory Quantum Chemistry), 75000 (Advanced Organic Chemistry), and 71000 (Advanced Inorganic Chemistry) or pass exemption examinations for these courses. Students are also required to complete an introductory course in Nanotechnology (78500), one 700-level elective (7XX00), and one 800-level elective, as well as to conduct a laboratory rotation (79051) through two or three laboratories during their first year. The 700-level and 800-level electives and selected lab rotations are based on the student's research interests and recommendations of the subdiscipline's advisers. Students who receive exemptions from any or all of the introductory courses (71000, 75000, 76000) will be permitted to take their 700- and 800-level electives in their first year based on advice from the student's subdisciplinary advisers. Students will choose a research team no later than the beginning of their third semester and form a Dissertation Committee early during their third semester.

A typical course schedule follows

First Semester:	76000, 71000 (or 75000)
Second Semester:	75000 (or 71000), 78500, 79051
Third Semester:	700-Level Elective
Fourth Semester:	800-Level Elective

Laboratory Rotation

Students will gain introductory laboratory experience in various synthetic approaches and physical characterization methods applicable to research in nanotechnology and materials chemistry during a lab rotation course (79051). Students will enroll in this course and conduct two to three lab rotations during their first year depending on their research interests and consultation with subdisciplinary advisers .

Second Examination

The Second Examination consists of the 800-level elective and oral defense of an original research proposal during the student's third or fourth semester. The research proposal is graded on the scale of high pass (A), pass (B), conditional pass (C), or fail. The average of the second-level course grade and oral defense grade must be no lower than pass (B). The grade for the oral defense may not be less than conditional pass.

Original Research Proposal

The purpose of the original research proposal is to initiate training of the student to independently define and solve scientific problems of current research interest. As such, the proposal may not be directly related to the student's thesis research. The procedure for the research proposal part of the Second Examination is described below.

- A. The student will choose a suitable topic for the proposal. The student is advised to start thinking about the research proposal early in his/her studies. Suitable topics could arise from discussions that occur in 78500, the 800-level elective, in seminars, or during study of literature. The student will submit a one-page abstract to the chair of the Nanotechnology and Materials Chemistry subdiscipline for approval. The abstract must be submitted at least one month before the end of the student's fourth semester. The subdiscipline chair, in consultation with other faculty as appropriate, will approve or disapprove the topic within one week. The student must have a topic approved before the end of his/her fourth semester. The student is encouraged to plan in advance and give his/her first subdiscipline seminar at the end of his/her fourth semester in the general area of the research proposal topic. This will allow the student to receive in advance critical comments that may be useful in writing the research proposal.
- B. Once a topic is approved, the student must prepare a written proposal. The proposal should consist of no more than six typed pages excluding references.

The proposal should concisely:

- 1) state the problem,
- 2) discuss the significance of the problem,
- 3) briefly review the pertinent literature, and
- 4) describe the research approach to solve the problem.

The student's dissertation adviser may help the student organize material used to prepare the proposal. References for the proposal will include all authors, article titles, journal, volume and inclusive page numbers. Students are encouraged to learn how to use database software for the management of references.

C. The subdiscipline chair will appoint a three-member Proposal Examining Committee (PEC). The student's dissertation adviser may not serve on the PEC.

D. The written proposal must be submitted to the PEC within the first month of the student's fifth semester. The PEC will inform the student within two weeks of the proposal's suitability for oral defense. If the proposal is unsuitable the student must submit a revised proposal within 30 days. The PEC will then set a date for the oral defense of the proposal no later than one month after the approval of the written proposal.

E. The purpose of the oral defense is to allow the student an opportunity to apply scientific logic and reasoning to the experimental solution of the problem. The student will deliver a 20-minute presentation that should:

- 1) state the problem he/she is trying to solve,
- 2) detail experiments and procedures to be utilized to solve the problem, and
- 3) discuss the interpretation of anticipated results.

The student must be prepared to answer questions posed by the PEC.

F. The PEC will transmit its evaluation and recommendation to the subdiscipline chair. In the case of an unacceptable defense of the proposal, the student will be advised of his/her deficiencies and given at most one month to satisfy requests of the PEC. The research proposal requirement should be successfully defended no later than the end of the student's sixth semester.

Students who fail to pass the defense for a second time will be terminated from the program.

The schedule described above applies to students who enter the program without advanced standing. For students entering the program with advanced standing, these requirements must be completed earlier. The exact timetable applicable to students with advanced standing will depend on the level of advanced standing and will be determined by the subdiscipline chair and the student's subdisciplinary advisers upon admission of the student to the program. The timetable for fulfilling the second-level requirements will be conveyed to the student upon the granting of advanced standing.

6. Advancement to Candidacy

To be certified as a candidate for the Ph.D. degree, a student must have successfully completed:

- 1) All required course work with a minimum overall average of B (3.0 GPA).

- 2) 60 credits of which at least 30 credits must be taken at The City University of New York.
- 3) First and Second Examinations.

On completion of these requirements, the Executive Officer sends the form “Advancement to Candidacy for the Doctoral Degree” (Appendix B) to the Graduate Center Registrar for approval. Advancement to Candidacy means that all degree requirements except submission of the Ph.D. dissertation and the Final Examination have been met.

V. DISSERTATION RESEARCH

I. Choosing a Research Mentor

The two most important tasks for first-year students are making satisfactory progress on first-level courses and examinations (Section IV.2) and selecting a faculty member to supervise dissertation research. The choice of a dissertation research mentor is extremely important and requires careful consideration. If you have any specific questions about choosing a research mentor, you should contact the Executive Officer for advice and information. The following general suggestions are made to assist you in the selection of a research mentor.

It is important to familiarize yourself with the research interests of the faculty. Brief descriptions of the research interests of each faculty member are given in the brochure “Doctoral Study in Chemistry” and at the website of the Ph. D. Program in Chemistry (<http://web.gc.cuny.edu/chemistry>). An additional reference is the *Directory of Graduate Research* published every two years by the American Chemical Society and available in most CUNY Chemistry Department offices and libraries. This book lists recent publications of each faculty member and the names and thesis titles of Ph.D. graduates. Additional information may be available at the various college Chemistry Departments and at the websites for these departments. Many faculty maintain their own websites; links to these can be found at the program’s website and the sites for the college Chemistry Departments. After examining this material, make appointments with those members of the faculty with whom you are most interested in working and discuss possible thesis research topics with them. Most faculty members will give you reprints of their recent papers. Dissertations of former graduate students are available for your inspection in the library and from the Executive Officer. You should evaluate all of this material in making your decision.

It is strongly recommended that you speak with at least four members of the doctoral faculty before you decide on a research mentor. You are not restricted to faculty at the campus

where you hold a teaching assistantship in your first year (see below). When you select a research mentor, please inform all of the faculty members you interviewed of your decision and submit the appropriate form (Appendix C.1) to the Executive Officer. The choice of research mentor requires the approval of the Executive Officer.

Please note that your choice of a research mentor also involves selection of the subdiscipline in which you intend to concentrate. This choice determines the Second Examination you are required to take. If a student wishes to change from one subdiscipline to another at any time, a written request to do so with an explanation of the reasons must be presented to the Executive Officer. Any such request must be approved by the Executive Committee. The Executive Officer will notify the student in writing of the decision of the Executive Committee.

You should begin speaking with possible research mentors at the conclusion of your first semester at the latest. The choice of a research mentor must be made no later than May 1 of the first year, and research should begin the following month. This applies to students entering in September or February. Students are expected to devote full time to research in the summer months. One last point about the selection of a research mentor should be emphasized. Although applicants to the CUNY Ph.D. Program in Chemistry select a college at which they intend to pursue research, it is possible to choose a research mentor from another college. If you are being supported by a teaching assistantship at one college and want to transfer to another, this support does not automatically follow you. You must secure financial support from the college to which you intend to transfer. This means that you must discuss the matter of support directly with both your prospective research mentor and the chair at the new college before announcing your decision.

Because the transfer of a student from one college to another requires changes in financial support and teaching assignments at two colleges, this decision should be made as soon as possible. You greatly increase your chances for support at the new college if you meet with the chair of that department early in the Spring semester before new students have been admitted for the following Fall semester. Once you have arranged such a transfer, you should immediately notify both the chair of your original department and the Executive Officer.

2. The Dissertation Committee

Once a research mentor has been selected and approved, the mentor and student will recommend a Dissertation Committee to the Executive Officer for approval. A copy of the Dissertation Committee Recommendation Form is in Appendix C.2. The Dissertation Committee is chaired

by the research mentor and must contain a minimum of two additional members of the CUNY doctoral faculty and the Executive Officer (ex officio). Please note that at least one of the members of the Dissertation Committee must be a member of the doctoral faculty in Chemistry at a college of the City University other than the one at which the research is being carried out. Meetings of the Dissertation Committee with the student are held annually to review the student's progress and to make specific recommendations about both the research project and the student's program of study.

The first Dissertation Committee meeting takes place during the semester that follows passing of the First Examination. A written report outlining the research problem, the plan of attack, and the work already carried out will be submitted by the student to each member of the Dissertation Committee and to the Executive Officer at least two weeks before the meeting. Each member of the Dissertation Committee will submit a Dissertation Committee Report (Appendix C.3) to the Executive Officer within one week of the meeting. Copies of these reports will be sent to the student.

Dissertation Committee meetings are then held at one-year intervals. The student will submit a written report to the members of the committee and to the Executive Officer at least two weeks before each meeting. This report should include not only a detailed description of the project and the work completed, but also a clear statement of the work to be undertaken in the coming year. Dissertation Committee reports will be submitted to the Executive Officer by all members of the Dissertation Committee within one week of the meeting. Copies will be sent to the student. Students who fail to have an annual meeting of their Dissertation Committee will not be allowed to register.

Although meetings of the Dissertation Committee are required annually, the research mentor will convene a meeting at any time at the request of either the student or any member of the Dissertation Committee. Further, additional members may be appointed to the Dissertation Committee by the Executive Officer at the request of any member of the Dissertation Committee.

The duties of the Dissertation Committee include an annual review and evaluation of the student's academic record and of the progress of the research project. The progress of the research project is evaluated from the student's written reports and from discussions with the student at the meetings of the Dissertation Committee. A review of the student's overall record should also be carried out at each Dissertation Committee meeting. This includes a review of the student's progress in courses and in First and/or Second Examinations. Upon request, the

Executive Officer will furnish details of the student's record. Any specific recommendations that the Dissertation Committee might make about the program of study or the research progress of a student should be made in writing to the Executive Officer.

In addition to reviewing and evaluating a student's progress in the Ph.D. program, the Dissertation Committee also must approve the student's dissertation and conduct the Final Examination. These topics are discussed in the next section.

3. **Submission of Dissertation and the Final Examination**

After a student has been advanced to candidacy and when the research mentor and the Dissertation Committee approve, the student begins the process of writing the doctoral dissertation. Detailed "Instructions for Preparing the Ph.D. Dissertation" are available from the Registrar (see Appendix D). Samples of all necessary forms are also included for your information (Appendix E). What follows is a brief description of the procedures of the Chemistry Ph.D. program. Check also to make sure that you are not in arrears with the Bursar and that you do not owe any books to any CUNY library.

When you write your dissertation, it may be helpful to examine previously accepted dissertations to get some idea of acceptable format and style. Dissertations are available in the Mina Rees Library at The Graduate Center and in the Executive Officer's office for your inspection. The organization of any dissertation depends to some extent on the nature of the work. Discuss the organization of your dissertation with your research mentor before you begin writing. A useful guide for writing professional papers in chemistry is the American Chemical Society's *Handbook for Authors*. Copies are available in the library or can be purchased from the American Chemical Society. The ACS *Handbook* should be consulted for style, for the format of references, tables, and figures, and for many other questions about acceptable manuscript preparation, but be sure to see Appendix D for style that supersedes ACS style. Questions about acceptable style and format should be addressed to the Dissertation Assistant in the Mina Rees Library **before** the dissertation is written. If the dissertation is not prepared according to the established guidelines, the Dissertation Assistant may refuse to accept it.

The ACS *Handbook* is written mainly for authors of journal articles. One major difference is footnotes, which are not generally used in Chemistry dissertations. Instead, references are numbered consecutively in the text and cited at the end of the dissertation.

When you complete the first draft of your dissertation, it should be read and corrected by your research mentor. After making all necessary corrections and with the approval of the research mentor, the dissertation is then presented to all of the members of the Dissertation

Committee, along with a copy of the form “Certification of Dissertation by Dissertation Committee Members” (Appendix E.1). The Final Examination can be scheduled only after each member of the Dissertation Committee returns the form to the Executive Officer. The student should generally allow at least three weeks for the reading of the dissertation by the members of the Dissertation Committee. It is the student's responsibility to notify each member of the Dissertation Committee that the dissertation is forthcoming and to arrange with them a specific date for the return of the “Certification of Dissertation” form to the Executive Officer. If the members of the Dissertation Committee either accept the dissertation as presented or accept the dissertation with minor revisions, the Final Examination can be scheduled as soon as all of the “Certification of Dissertation” forms have been received by the Executive Officer. One copy of the dissertation must also be sent to the Executive Officer before the defense is scheduled. The student arranges a day and time for the Final Examination with the members of the Dissertation Committee and then contacts the Executive Officer who will request that the Provost formally schedule the defense. Please note that the Office of the Provost needs two weeks’ notice to schedule a defense.

If one or more members of the Dissertation Committee require that major revisions be made before the Final Examination is scheduled, the dissertation is returned to the student for revision. The revised dissertation is submitted to the Dissertation Committee, and it must be accepted by the research mentor and two other members of the Dissertation Committee before the Final Examination can be scheduled. The process of scheduling the Final Examination was outlined in the previous paragraph.

Important: Approximate deadline dates for committee certification and deposit of dissertation are:

	Committee Certification and Request for Scheduling Defense	Successful Defense and Deposit of Dissertation
Graduation in		
October	August 15	September 14
February	January 15	January 31
June	April 15	April 30

The actual dates for a given semester are given in the GC website; see also Appendix D.

Please note that you must be registered during the semester when you deposit your dissertation. Registration for the Fall semester will be required if you miss the September deadline, and for the Spring semester if you miss the January deadline.

The Final Examination is a public oral defense of your dissertation. The examining committee is your Dissertation Committee, and your research mentor acts as the chair of the examining committee. A typical Final Examination consists of an oral presentation of the dissertation by the candidate and questions about the work from the members of the examining committee.

Before your Final Examination, request a copy of the form “Report of Final Examination” (Appendix E.2). This will be typed for you and ready for signatures. After the examination, the committee decides which box to check and each member signs the form. The form is brought to the Executive Officer for signature and forwarded to the Provost. If the dissertation requires only minor revisions, the research mentor must approve them and forward the form “Approval of Revised Dissertation” (Appendix E.3) to the Executive Officer. This generally will not delay a student's graduation. In the rare circumstance that major revisions are required at this point, the entire Dissertation Committee must approve the revised dissertation.

You must also bring with you to the Final Examination an original copy on dissertation-quality paper of the Approval Page (see “Instructions for Preparing the Ph.D. Dissertation,” Appendix D) which is signed by each member of your Dissertation Committee and the Executive Officer. This goes into your bound dissertation.

The next step is the deposit of your dissertation with the Dissertation Assistant in the Mina Rees Library. Call to make an appointment. You must submit: (1) two copies of your dissertation on dissertation-quality paper and one electronic copy in PDF format; (2) two extra copies of the dissertation abstract; (3) one extra title page; (4) the original approval sheet. Also bring a check for required fees. The Dissertation Assistant will give you instructions about your clearance with the Bursar, Financial Aid Office, Librarian, and Registrar.

Copies of the dissertation prepared for your mentor, college department, and others may be printed on regular copy-quality paper. If you did research at either Brooklyn College or Queens College, you must also deposit a bound copy of your dissertation with the chair of the Chemistry Department or your final paycheck may be delayed. The Dissertation Assistant will send a bound copy to the college via intercampus mail if requested to do so at the time you deposit your dissertation.

Any research, whether or not it involves human subjects, must be approved by the Human Subjects Committee prior to starting the research. The approval form, signed on behalf of the Human Subjects Committee, must be included with the dissertation when it is deposited. No dissertation will be accepted without one of these forms. Please contact Ms. Hilry Fisher, Director of Sponsored Research, 212-817-7523, for information.

VI. Registration, Tuition, and Fees

I. Registration

Information about registration procedures, deadlines and a schedule of tuition and fees is published at the beginning of each semester on the GC website.

Students who have not yet passed all parts of the First Examination must make an appointment with the Executive Officer for advisement and registration each semester. Students who have completed the First Examination may either make an appointment with the Executive Officer for advisement and registration or submit a completed “Status & Registration Form” to the Executive Officer for approval.

If a student wishes to register for a course given at one of the colleges of CUNY, either for credit or on an audit basis, registration for that course is included as part of the student's registration at The Graduate Center. No additional tuition is required for courses taken at other CUNY campuses.

The Graduate Center is a member of the Interuniversity Doctoral Consortium, which provides for cross registration among member institutions. Matriculated CUNY doctoral students may cross register for doctoral study in the graduate schools of arts and sciences of the following institutions: Columbia University (including Teachers College), Fordham University, New School University, Rutgers University, Princeton University, Stony Brook University, and New York University. The general terms for participating in the interuniversity cross-registration project are described in the *Student Handbook*. A registration form available in the Office of the Registrar must be completed. Approval of the Executive Officer is required. Any registration questions regarding the consortium should be addressed to the Office of the Registrar. Academic or policy questions should be directed to the Office of the Vice President for Student Affairs.

A. Auditing of Courses

A full-time graduate student may audit undergraduate CUNY courses without charge with the approval of the appropriate undergraduate authority. Approval of the Executive Officer is also

required. Auditing undergraduate courses is sometimes recommended when a student's undergraduate training in a particular subdiscipline is not sufficient for the student to pursue successfully the first-level Ph.D. course in that subdiscipline.

Full-time doctoral students who have completed 60 credits and all course requirements are permitted to audit additional Ph.D. courses if they choose, at no cost.

B. Adding and Dropping Courses

During the first three weeks of each semester students have the option of adding and/or dropping courses from their initial program. During this period, courses can be dropped without penalty. If a student elects to withdraw from a course after the first three weeks of the semester, a grade of W will appear on the transcript for this course. Approval of the Executive Officer is required to add or drop courses. See the *Student Handbook* for information on fee consequences of withdrawing of courses.

C. Leave of Absence

A leave of absence will be granted to a student wishing to interrupt doctoral study for up to one year. The leave request should be made in writing prior to the semester during which the leave will be taken (Appendix F). Each request for leave, preferably on a semester basis, must be approved by the Executive Officer and be cleared by the Offices of Financial Aid, Chief Librarian, Business, and International Students. Requests for an extension of a leave of absence, for no more than one additional year, must follow the same procedure. A student cannot be granted a total of more than two years (four semesters) of leave of absence during his/her entire period of matriculation. Official leave of absence time is not counted toward the time limit for completion of degree requirements. Any student subject to induction or recall into military service should consult the veterans' adviser (the Registrar) before applying for an official leave.

D. Withdrawal and Readmission

Written notice (Appendix G) of voluntary withdrawal from the program must be approved by the Executive Officer and forwarded to the Registrar. All applications for readmission are handled by the Registrar. Written approval of the Executive Officer is required.

2. Tuition Level Status

The tuition paid by students is dependent on the number of credits of graduate work completed. This includes credit for courses taken as a student in the Ph.D. Program in Chemistry as well as any credit for graduate courses taken elsewhere for which transfer credit is granted. If you have

taken graduate courses elsewhere and wish to receive transfer credit for those courses, you must consult with the Executive Officer, who will complete the form “Advanced Standing Transfer Credit Recommendation” (Appendix H) and submit it to the Registrar for approval. Credits transferred in this way do not affect the course requirements you must complete as a student in the Ph.D. program, but they do affect your tuition level as explained below. Evaluation of transfer credits occurs after successful completion of the First Examination requirement.

The most important category of advanced standing transfer credit concerns those students who enter the Ph.D. program with an earned master’s degree. With an official transcript and diploma, such a student may receive a maximum of 30 advanced standing transfer credits. Please be advised, however, that transfer credits cannot be used toward the credit requirement of the en-route master’s degree (see below). If a student took some graduate courses elsewhere but did not complete a degree, advanced standing transfer credit may be approved for some of the courses taken.

A student is a Level I student for tuition purposes until a minimum of 45 credits of graduate work have been fully earned and evaluated and the First Examination requirement has been met. Incomplete grades do not count toward the total 45 credits earned.

Even if a student enters with no transfer credit, Level II can often be attained before the fourth semester of study. This is accomplished by successfully completing the First Examination requirement and taking additional credits in course work and research (79500 and 81000) to bring the total credits earned at that point to 45. While required course work is given the usual letter grades, acceptable work in research courses such as 81000 normally is graded as SP, meaning satisfactory progress. An SP is counted as credits earned but is not included in the evaluation of a student’s grade point average.

A student remains at Level II until the requirements for advancement to candidacy have been met. These requirements are: (1) the completion of a minimum of 60 credits; (2) the completion of all required courses; and (3) passing the Second Examination in the subdiscipline. At this point the student is advanced to Level III for tuition purposes. Once Level III has been attained, a student registers each semester for Dissertation Supervision (90000) for 1 credit and the appropriate Advanced Seminar (805XX), which is taken on an audit basis. Additional lecture courses may also be taken on an audit basis. If a Level III student wishes to take a lecture course for a letter grade, additional tuition must be paid for the course as described in the “Announcement of Courses.”

Your bill each semester should reflect your correct tuition level. If it does not or if you think an error has been made, contact the Executive Officer or the Registrar to petition for a change of level. This must be done by the end of the third week of classes (see the calendar in the "Announcement of Courses" for the exact date each semester). No changes in level status will be allowed in that semester after that date.

VII. Financial Assistance

Many of the various forms of financial assistance for doctoral students are described in the *Bulletin* of The Graduate Center and the Office of Financial Aid's website.

Financial assistance is most commonly available in the form of Graduate Assistantships, which involve an undergraduate teaching obligation on the part of the graduate student. One of the requirements of the Ph.D. Program in Chemistry is that each Ph.D. student acquire experience in college teaching by serving as a teaching assistant in the undergraduate classroom and/or laboratory. Teaching assignments are made by the chairs of the various departments as described in Sections III and V.I.

Three forms of teaching appointment are available for doctoral students through the individual chemistry departments. The salaries for these positions are determined by union contract and are subject to change as new contracts are periodically negotiated. The salaries quoted below are for illustrative purposes only. The amounts correspond to rates effective on August 1, 2001.

1. An appointment as a Graduate Assistant A carries a salary of \$8,308 per semester. The teaching load for a Graduate Assistant A is typically 8 contact hours per week. This is usually met by teaching two recitation/laboratory sections per week.
2. A Graduate Assistant B appointment carries a \$4,153 per semester salary and a teaching load of 4 contact hours per week.
3. A Graduate Assistant C appointment carries a \$6,231 per semester salary.
4. Appointment as an Adjunct Lecturer pays \$53.60 per instructional hour. For a 4-contact hour load over a 15-week semester, this amounts to \$3216 per semester.

Support for graduate students often involves a combination of Graduate Assistant B and Adjunct Lecturer appointments.

A third form of financial support is the University Fellowship awarded by The Graduate Center. The amount of such an award is variable but is typically equivalent to a Graduate Assistant B. The award carries no teaching obligation, but University Fellows are required to

render 4½ hours per month of research service for each \$1000 of fellowship support. Research assignments are made by the Executive Officer. If a recipient of the University Fellowship has a tuition obligation, an amount equal to the tuition due is withdrawn from the University Fellowship award and applied to the student's tuition account.

Applicants to the Ph. D. Program in Chemistry may be nominated for a Science Fellowship, which usually provides \$12,000 per year for the first two years of study. This award, which has no teaching or service obligation, helps students by giving them more time to complete required courses and begin their dissertation research project. If a recipient of this fellowship has a tuition obligation, an amount equal to the tuition due is withdrawn from the award and applied to the student's tuition account.

It is possible in some cases for students to secure support through their research mentors. If a research mentor has a research grant, support for doctoral students working on projects related to that grant may be available. Such support is arranged directly between the student and the research mentor. Stipends are distributed by the Research Foundation of CUNY.

Finally, other forms of support are available through The Graduate Center and are described in the *Bulletin, Student Handbook*, and "Financial Assistance." These include funds for travel and dissertation support. An application is required and must be endorsed by the Executive Officer.

Because graduate course work and dissertation research are the primary responsibilities of doctoral students, they are expected to devote most of their time to these activities. Most doctoral students are supported through teaching assistantships involving 7 or more contact hours, or research assistantships, or fellowships providing equivalent support as described above. The combination of all these responsibilities is considered to be a full-time occupation. It is therefore understood that anyone holding a teaching position with 7 or more contact hours, or an equivalent research assistantship or fellowship, shall not undertake any additional outside employment. This precludes, for example, teaching or other duties at other colleges within or outside of CUNY. Similarly, paid tutoring should be limited to a few hours per week at most.

It should also be noted that CUNY bylaws do not allow any graduate student to hold more than a Graduate Assistant A or to teach more than 9 contact hours as an Adjunct Lecturer within the University. A Graduate Assistant A cannot be supplemented by any form of additional research assistantship or adjunct teaching position during the academic year or the summer period.

VIII. Master of Philosophy and the En-route Master's Degree

A doctoral student who is making normal progress toward the Ph.D. degree is automatically eligible to receive a Master of Philosophy degree when advanced to candidacy. This occurs when all degree requirements except the dissertation and Final Examination have been met. When the student is advanced to candidacy, an application-for-degree form is sent to the student along with the notice of advancement to candidacy. The Master of Philosophy degree is awarded by The Graduate Center.

An en-route master's degree may be awarded by the college at which the student does research. It requires a minimum of 45 credits with an average grade of B, passing the First Examination, and satisfactory completion of a major research paper. The requirement of 45 credits cannot include courses for which SP grades are received or any advanced standing transfer credits. The student who wishes to receive an en-route master's degree should make an appointment with the Executive Officer who must initiate the appropriate application.

IX. Summary of Requirements for the Degree of Doctor of Philosophy

A student who follows the course of study presented in Section IV.5 and completes an acceptable dissertation will have completed all of the requirements for the Ph.D. degree. The following are the general requirements of The Graduate Center. These requirements are also stated in the *Bulletin*.

1. At least 30 of the credits required for the degree must be taken in residence at the City University. Doctoral students are expected to spend one year in full-time residence at the City University. This consists of a schedule of no less than 12 credits or the equivalent for each of two consecutive semesters.
2. All work must be completed no later than eight years after matriculation. A student who matriculates after completion of 30 credits of acceptable work must complete all requirements within seven years.
3. At least 60 credits of approved graduate work, including the course requirements in the field of specialization, are required for the degree.
4. Each student must pass a First Examination in his or her field. The examination shall be oral and/or written and may be administered in parts over an extended time period. A student may continue in the doctoral program after completing 45 credits only if he or she has passed this examination.
5. A Second Examination is required.

6. To be certified as a candidate for the Ph.D., the student must complete all required course work, with at least an overall B average, of which at least 30 credits must be taken at the City University; the Second Examination; and any special departmental requirements for certification.
7. The student must complete a dissertation embodying original research that must be defended at an oral Final Examination and be deposited in the Mina Rees Library of The Graduate Center before the degree is granted. The dissertation must be microfilmed or published. The student must be registered during the semester the degree is granted.

NOTICE OF NONDISCRIMINATION

The Graduate School and University Center of The City University of New York is an equal opportunity and affirmative action institution. The GC does not discriminate on the basis of age, gender, sexual orientation, alienage or citizenship, race, color, national or ethnic origin, religion, marital status, veteran status, or disability in its student admissions, employment, access to programs, and administration of educational policies.

The GC is committed to promoting pluralism and diversity and combating racism and bigotry. Concerns, questions, complaints, and suggestions about affirmative action and equal employment may be addressed to any member of the GC Affirmative Action Committee through the Affirmative Action Officer.

The City University of New York prohibits sexual harassment and has instituted policies, procedures, and educational programs to prevent and address sexual harassment. For more information, please contact the coordinator of the Sexual Harassment Panel or see the *Student Handbook*.

Employees and applicants are protected from coercion, intimidation, interference, or discrimination for filing a complaint or assisting in an investigation concerning discrimination or harassment.

CONTACTS

Affirmative Action Officer: Edith Rivera-Cancel, Room 7301; 212 817-7410

504/ADA Coordinator: Vice President for Student Affairs, Matthew Schoengood, Room 7301; 212 817-7400.

Title IX Coordinator: Vice President Matthew Schoengood, Room 7301; 212 817-7400.

Coordinator, Sexual Harassment Panel: Professor Michelle Fine; 212 817-8710.

Ombuds Officer: Professor Rolf Meyersohn; call for appointments at 212 817-7190. The Ombuds Officer offers complete confidence to any individual in the GSUC community in discussing informal as well as formal solutions to any problem.

Assistant Vice President for Human Resources: Yosette Jones Johnson, Room 8403; 212 817-7700.