

HANDBOOK FOR DOCTORAL STUDENTS IN CHEMISTRY

**CUNY Graduate Center
Chemistry Program, Room 4310
365 Fifth Avenue
New York, NY 10016**

chemistry@gc.cuny.edu

[www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/
Doctoral-Programs/Chemistry](http://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Doctoral-Programs/Chemistry)

THE CITY UNIVERSITY OF NEW YORK

THE GRADUATE SCHOOL AND UNIVERSITY CENTER

Fall 2014

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 may 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 Fall 2014 and is supplementary to the information and regulations contained in the *Graduate Center Bulletin*, *Graduate Center Student Handbook*, and *Bylaws and Governance* document of The Graduate School and University Center, which are also available online.

HANDBOOK FOR DOCTORAL STUDENTS IN CHEMISTRY

Contents

I	Introduction	4
II	Structure of the Ph.D. Program in Chemistry	4
	1. Subdisciplines	5
	2. Executive Committee	5
	3. Standing Committees	6
III	Student Advisement	8
IV	Course and Examination Requirements	10
	1. Qualifying Examinations	10
	2. Official Course Listing	11
	3. First-Level Courses and First Examination	11
	4. Other Course Requirements	13
	5. Seminars	14
	6. Rotations	15
	7. Sample Schedules and Second Examination	15
	<i>Requirements for each subdiscipline</i>	16
	A. <i>Analytical Chemistry</i>	16
	B. <i>Inorganic Chemistry</i>	18
	C. <i>Organic Chemistry</i>	20
	D. <i>Physical Chemistry</i>	23
	E. <i>Polymer Chemistry</i>	25
	F. <i>Molecular Biophysics</i>	29
	G. <i>Nanotechnology and Materials Chemistry</i>	32
	8. Advancement to Candidacy	35
V	Dissertation Research	36
	1. Choosing a Research Mentor	36
	2. The Dissertation Committee and Annual Committee Meetings	37
	3. Submission of Dissertation and the Final Examination	39
VI	Registration, Tuition, and Fees	42
	1. Registration	42
	A. Auditing of Courses	43
	B. Adding and Dropping Courses	44
	C. Leave of Absence	44
	D. Withdrawal and Readmission	44
	2. Tuition Level Status	44
VII	Financial Assistance	46
VIII	Master of Philosophy and the <i>En-route</i> Master's Degree	47
IX	Summary of Requirements for the Degree of Doctor of Philosophy	48
X	NOTICE OF NONDISCRIMINATION	49
XI	CONTACTS	50

Appendix*

- A Official Course Listing and Course Descriptions
- B Form: "Advancement to Candidacy for the Doctoral Degree"
- C
 - 1. Form: "Selection of Mentor"
 - 2. Form: "Thesis Committee Recommendation Form"
(Faculty agree to be on your committee)
 - 3. Form: "Thesis Advisory Committee Report"
(Used for required annual meetings)
- D Instructions for Preparing the Ph.D. Dissertation
- E
 - 1. Form: "Certification of Dissertation by Thesis Committee Members"
 - 2. Form: "Report of Final Examination"
 - 3. Form: "Approval of Revised Dissertation"
- F Form: "Request for Leave of Absence"
- G Form: "Request for Withdrawal"
- H Form: "Advanced Standing Transfer Credit Recommendation"
- I Form: "Certification of Defense of Research Proposal"

*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://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Doctoral-Programs/Chemistry>). 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 *Graduate Center Student Handbook*, which is online at:

<http://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Doctoral-Programs/Chemistry/Student-Handbook>

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, John Jay College, Lehman College, Queens College, College of Staten Island, and York College. 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 members 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 seven 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.
 - (7) the Deputy Executive Officer.
- 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 or electronic 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. As of the second semester students may, in addition, seek the advice of the sub-discipline chairs on course selection and requirements for their sub-disciplines. 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.

Entering graduate students receive their first year of support from the Graduate Center (see Section VII). After the first year, a student's stipend comes from their mentor and the host college in which they work, and may include a teaching assignment. 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 always available for student advisement concerning examinations and other requirements of their subdiscipline.

Useful contact information is given below.

EXECUTIVE OFFICER

Graduate Center

Professor Brian Gibney (212) 817-8136 (tel)

bgibney@brooklyn.cuny.edu

DEPUTY EXECUTIVE OFFICER

To be named

ASSISTANT PROGRAM OFFICER

Graduate Center

Noa Borkan, Assistant Program Officer (212) 817-8135 (tel)

nborkan@gc.cuny.edu

DEPARTMENT CHAIRS

Brooklyn College

Professor Malgorzata Ciszowska (718) 951-5758 MalgCisz@brooklyn.cuny.edu

City College

Professor Daniel Akins (212) 650-6953 akins@sci.ccny.cuny.edu

Hunter College

Professor Michael Drain (212) 772-5330 cdrain@hunter.cuny.edu

Lehman College

Professor Gustavo Lopez gustavo.lopez1@lehman.cuny.edu

College of Staten Island

Professor Qiao-sheng Hu 718 982-3901 qiaosheng.hu@csi.cuny.edu

Queens College

Professor Wilma Saffran (718) 997- 4195 Wilma.Saffran@qc.cuny.edu

York College

Professor Ruel Desamaero (718) 262-2657 rdesamero@york.cuny.edu

SUBDISCIPLINARY CHAIRS

Analytical

Professor Robert Nolan, Graduate School and University Center
(212) 817-8248 rnolan@gc.cuny.edu

Inorganic

Professor Roberto Sanchez-Delgado, Brooklyn College
(718) 951-2827 rsdelgado@brooklyn.cuny.edu

Organic

Professor Stephen Fearnley, York College
(718) 262-2660 sfearnley@york.cuny.edu

Molecular Biophysics

Professor Zimei Bu, City College
212-650-8169 zbu@ccny.cuny.edu

Nanotechnology and Materials

Professor Stephen O'Brien, City College
(212) 650-3791, 3827 sobrien@ccny.cuny.edu

Physical

Professor Jianbo Liu, Queens College
718-997-3271 Jianbo.Liu@qc.cuny.edu

Polymer

Professor Nan-Loh Yang, College of Staten Island
(718) 982-3899 NanLoh.Yang-cepm@csi.cuny.edu

IV. COURSE AND EXAMINATION REQUIREMENTS

1. Qualifying Exams

All entering graduate students take the Qualifying Exams in *organic, inorganic and quantum chemistry* upon arrival and before the start of classes. Each exam is to assess

prior preparation for the first level coursework that will be assigned in the first semester. These exams typically are made up of a multiple choice answer section. Performance in the Qualifying Exams is used for advisement of the student's course selection. An A grade in the Qualifying Exam will permit the student to be exempted from any first level course so long as it is not that student's chosen sub-discipline.

2. 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, which meet one day in January and one day in June.

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, also referred to as moving to Level III. (See Section IV.9)

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 students are interested in having a particular course offered, they should contact the Executive Officer or the appropriate subdisciplinary chair.

3. First-Level Courses and First Examinations

The lecture courses that have a First Examination requirement are:

Chem. 71000 Advanced Inorganic Chemistry	3 credits
Chem. 73000 Polymer Chemistry (open to those selecting the Polymer sub-discipline)	3 credits
Chem. 75000 Advanced Organic Chemistry I	3 credits
Chem. 76000 Introduction to Quantum Chemistry	3 credits

These are the First-level courses. The First Examination in each First-level 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 corresponding subdisciplinary chair. The results of the grading of the First Examination and recommendations concerning student performance are presented by the corresponding 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. In some cases, it is 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. Satisfactory progress generally means passing all three parts of the First Examination during the first year, and attending any seminars and presentations that are required components of the program.

Based on the decisions of the Executive Committee, the Executive Officer will inform the students 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.

Students may take Qualifying Examinations to be exempted from the First Examination courses not in their sub-discipline. A clear pass on a Qualifying Examination allows a student to be exempted from the corresponding First Examination course. For example, the required course for a student of the physical chemistry subdiscipline is 76000. A physical chemistry 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. (See Section IV.1)

Another 7XXXX course(s) required of all students is the 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, City College, John Jay College or Queens College on a rotating basis; 79002 (Organic) is offered at the Graduate Center; 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 typically offered during the fall semester. Students are expected to take this course in their first semester.

During the first week of classes, a student may request a First-Level Exemption Examination in the First Examination course of their chosen subdiscipline, provided the student performs exceptionally well on the Qualifying Exam. If a student passes the exemption exam in the First Examination course of their chosen subdiscipline, the student is exempt from this course. For example, a physical chemistry 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.

4. Other Course Requirements

In addition to the First level courses and the 7900X or 790XX courses required of all students, each subdiscipline requires other courses. The basic second level course 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	83901
84904	7XXXX or	75200 Rec	77000	83902
84905	8XXXX	Two 8XXXX	8XXXX Rec	

<u>Mol. Biophys.</u>	<u>Nano. & Mat. Chem.</u>
BICM 77000	78500

87901

7XXXX elective

8XXXX elective

The usual scheduling of 7XXXX courses is:

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

Spring: 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.

5. 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, which are held at the end of each semester for one day, usually in January and in June. 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.

6. Rotations

As a part of the process of selecting a mentor, students are required to perform at least three Rotations in three laboratories of their choice during their first year. To obtain credit for their Rotations, students register for 79500 during their first semester under the supervision of the Executive Officer, and for 79041, 79051 or 79500, under supervision of the subdiscipline chair, during their second semester. Rotations are short stays, usually about 1 month to six weeks, working in a faculty member's laboratory. The student must contact the faculty member and ask for permission to perform a Rotation in their lab and to discuss what work they are expected to do as part of the Rotation. Students should select faculty members whose research is of interest to them, and that may be potential mentors for them. In order to meet members of the faculty that are seeking Ph.D. students for their research, student attend a Friday Seminar during their first semester, in which faculty from the different campuses present their research.

7. 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.

Schedules for the first year usually involve taking the three required first level 7X000 lecture courses in the first semester. In addition, students register for 3 or more credits of 79500 under the guidance of the Executive Officer. As part of this course, the students will attend a series of research presentations by research-active faculty members from the various campuses. Attendance at these presentations is mandatory. In addition, they will perform one laboratory "rotation" in the research laboratory of a faculty member of their choice. In the Spring semester students will perform two more laboratory "rotations" with faculty members of their choice. These rotations will begin the process for making their mentor selection.

Any questions that first-year students may have about planning their schedules should be addressed to the Executive Officer by appointment. 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 should be addressed to 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 courses are taken as required *each* semester in addition to the courses listed in the schedules below.

Requirements for Each Subdiscipline

A. ANALYTICAL CHEMISTRY

A student wishing to specialize in Analytical Chemistry must complete the First Examination requirement. The required 7XXXX 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: 71000, 75000 and 76000

Second semester: 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.

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, Chemical Separations (84903), Electroanalytical Chemistry (84904) and, Analytical Spectroscopy (84905).

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. General guidelines for the written proposal and the oral defense are provided in section IV.8 of this Handbook.

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 Proposal Examination Committee (PEC) 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 written proposal.
- 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.
- f. The committee members, through the chair, will notify the Executive Committee of their recommendation.

B. INORGANIC CHEMISTRY

Students of the Inorganic Chemistry subdiscipline must pass courses and First Level Examinations in Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000) and Introduction to Quantum Chemistry (76000). Students are also required to pass Basic Laboratory Techniques for Research (79001) in their second semester. The

Second Examination should begin during the third semester, following the completion of the First Examination requirement.

Further elective courses in the 7XXXX or 8XXXX series (a total of two are required) will be determined by the student's research interests and the recommendations by the student's mentor, thesis committee, or subdiscipline chair. A typical course schedule is the following:

<i>First Semester:</i>	71000, 75000 and 76000
<i>Second Semester:</i>	79001, 79500, another 7XXXX course
<i>Third Semester:</i>	81900 or 7XXXX or 8XXXX elective and preparation and defense of research proposal.
<i>Fourth Semester:</i>	81900 or 7XXXX or 8XXXX elective and preparation and defense of research proposal (if not completed during the third semester).

Second Examination

The Inorganic Chemistry Second Examination, which should begin in the fall semester of the second year, consists of two parts: **Part 1** is a series of four exams administered by individual faculty. **Part 2** is an original research proposal to be defended before members of the Inorganic Chemistry faculty. Towards the end of the second semester the student, in consultation with the mentor and the subdiscipline chair must select the four examiners for Part 1. These examinations will then be given at approximately one-month intervals, during the fall semester of the second year. Within one month of the successful completion of Part 1, the student will submit to the chair of the Inorganic Chemistry subdiscipline a title and a 1-page abstract of the original research proposal for approval. Once the topic has been approved, the full proposal should be prepared and defended, normally 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, provide a list of references and outline the limits of the topic to be treated in the examination. Once the examination has been scheduled, the student must submit a written summary (about 4-5 pages) to the examiner, at least one week prior to the date of the exam. Students are strongly encouraged to contact the faculty examiner for

advice and/or clarification in preparing for each examination.

Part I exams are graded on the basis of high pass, pass, conditional pass, or fail. If the student fails one of the examinations in the fall semester, a further exam must be passed during the spring semester of the second year. A student may have at most one conditional pass. The overall performance on Part I is evaluated by the chair of the Inorganic Chemistry subdiscipline in consultation with the faculty examiners.

Part 2: Research Proposal The tentative title and 1-page abstract must be submitted at the beginning of the fourth semester to the subdiscipline chair, who will approve or disapprove it within a week of submission, in consultation with other faculty members as appropriate. Once the topic has been approved the proposal must be prepared and defended during the fourth semester. The subdiscipline chair will provide the student with detailed guidelines to develop the proposal. General guidelines for the written proposal and the oral defense are provided in section IV.8 of this manual.

The defense will be examined by a Proposal Examining Committee (PEC), which consists of the chair of the Inorganic Chemistry subdiscipline and at least two other Inorganic Chemistry faculty members. Students should consult their research mentor and/or the chair of the Inorganic Chemistry subdiscipline for further 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. There are two other 70000-level courses: Advanced Organic Chemistry II, Synthetic Organic (75100), which is required of all organic chemistry students, and Quantum Organic Chemistry (75200), which is recommended, but not required. Chem 75100 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, 8XXXX courses have been taught in the following areas: Organometallic Chemistry, Heterocyclic

Chemistry, Stereochemistry, 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:

<i>First Semester:</i>	71000, 75000 and 76000
<i>Second Semester:</i>	75100, 79002, 8XXXX course
<i>Third Semester:</i>	75200 and preparation and defense of research proposal.
<i>Fourth Semester:</i>	8XXXX course and preparation and defense of research proposal (if not completed during the third semester).

Second Examination – Cumulative Examinations (cumes)

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. Delays in starting the examinations are not permitted. February, March, and April cumes in the first year are “free cumes”; that is, a pass counts but a fail does not. Students must pass at least three cumulative examinations by the end of the second year with no more than six fails.

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.

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

Satisfactory progress consists of passing at least two cumulative examinations the first year, and completing the full cume requirement by the end of the second 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, 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 that do not pass two cumes by the end of the second year may be terminated by the program.

In practice, very 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.

Research Proposal

Upon completion of the cume requirement, each student must submit a topic of original research proposal to the Steering Committee. Students must write and defend the proposal before the end of the fourth year. Upon successful completion of the cumes and defense of the original research proposal, the student will be advanced to candidacy, or move on to Level Three. General guidelines for preparation of the written proposal and the oral defense are given in Section IV.8 of this Handbook.

Research Proposal Rules and Procedures:

1. Once a student submits a topic of proposal, the subdiscipline 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 he or she submits a topic of proposal, 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 an opportunity to submit a second proposal and defend. Those students still have to defend the proposal before the end of the fourth year.

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 7XXXX courses. Elective courses in the 8XXXX series may be recommended by a student's research mentor or Dissertation Committee. 8XXXX courses may be taken as early as the fourth semester. A typical course schedule follows:

<i>First Semester:</i>	71000, 75000 and 76000
<i>Second Semester:</i>	76100, and 79001
<i>Third Semester:</i>	77000 course and preparation and defense of research proposal
<i>Fourth Semester:</i>	Recommended 8XXXX course and preparation and defense of research proposal (if not completed during the third semester).

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 the writing and oral defense of a Research Proposal.

The purpose of the Research Proposal is to encourage students to develop independent ideas, to train students to define and solve scientific problems of current research interest independently, and to acquire training in grant writing. The topic proposed must therefore be clearly different from the student's Dissertation subject.

Typically, the process begins during the students' third and fourth semesters. At this time, the student must submit a one page abstract identifying the topic of interest to the subdiscipline chair who will assemble a Proposal Examining Committee (PEC), consisting usually of three faculty members. The student's research mentor may not be part of the PEC.

Once the topic has been approved by the subdiscipline chair and the PEC, the student must prepare a written Research Proposal. The proposal should be on the order of 10 pages in length, excluding references and usually prepared using 1.5- line spacing and 12-point font. References must be properly formatted. A Research Proposal must clearly and concisely state:

- 1) the problem being addressed
- 2) the significance of the problem
- 3) past work related to the problem (literature review)

- 4) the approach to be taken
- 5) the expected results

The written proposal is submitted to the PEC. Once the written proposal has been approved by the PEC, the student must schedule an oral defense of the proposal. If the written proposal is not approved, the student is given an opportunity to address the deficiencies described by the PEC and resubmit the revised written proposal.

For the defense of the Proposal the student must prepare a power point presentation that should last no longer than 30 minutes, excluding questions. The presentation is followed by questions from the examiners as well as a discussion about the viability of the proposed research plan.

E. POLYMER CHEMISTRY

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

The Second Examination in Polymer Chemistry consists of two second-level courses and 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.

A typical course schedule is:

<i>First Semester:</i>	73000 and any <u>two</u> of the three 70000 courses (71000, 75000, 76000)
<i>Second Semester:</i>	79003, 83901 (or 83902 or 83903) and preparation and defense of research proposal
<i>Third Semester:</i>	83902 (or 83901 or 83903) and preparation and defense of research proposal (if not completed during the third semester).

Fourth Semester: Possible elective

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

Students must write and defend proposal before the end of the fourth year. General guidelines for preparation of the written proposal and the oral defense are given in Section IV.8 of this manual. 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 will pursue coursework and research training that draws from Chemistry, Biochemistry, Physics, and Engineering disciplines. The requirements overlap strongly with the standard Chemistry curriculum but include several substitutions. In this subdiscipline, students must pass the courses and First Examinations in Advanced Inorganic Chemistry (71000), Advanced Organic Chemistry I (75000), and Introductory Quantum Chemistry (76000) or pass exemption examinations for these courses. Students should consult with the subdiscipline Chair to design a course in Basic Laboratory Techniques for Molecular Biophysics (79041), which consists of three (3) research rotations (literature review, small lab/computational projects, new skills, brief presentations) in the labs of prospective mentors. Students are expected to choose a mentor by the end of the

second semester and to form a dissertation committee before beginning their third semester of study.

In addition to the Chemistry core courses, students are required to take Physical Biochemistry (BICM 77000), which is offered in the spring semester and should be preceded by an undergraduate Biochemistry course. Finally, students take an interactive research-style Molecular Biophysics course (87901) in which students are assigned a macromolecular target for study within an overall course theme. The latter course culminates with an original research proposal, which is designed to enhance creative and critical thinking and may be adapted for the Second Level Examination (see below). A typical course schedule follows:

First Semester: 76000, 71000 and 75000

Second Semester: BICM 77000, 79041 (3 labs)

Third Semester: 87901) and preparation and defense of research proposal.

Fourth Semester: preparation and defense of research proposal (if not completed during the third semester).

Molecular Biophysics students also enroll each semester in the 80541 seminar course, which typically involves attendance at seven presentations in the New York Metropolitan area and includes student participation through either brief reports on each talk or development of one talk topic into an end-of-semester oral presentation.

Second Examination

The Second Examination consists of the Molecular Biophysics course (87901) and an original research proposal, designed to initiate training of the student in the independent definition and solution of current research problems.

Research Proposal

The proposal topic is developed during the Molecular Biophysics course (87901) and may not be directly related to the student's thesis research. This proposal should be defended orally during the January between the third and fourth semesters of study; the grading scale includes high pass (A), pass (B), conditional pass (C), and fail (F). 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 should follow an earlier schedule, as determined by the subdiscipline Co-Chairs. General guidelines for preparation of the written proposal and the oral

defense are given in Section IV.8 of this manual.

The procedure is described below.

1. Directly after oral presentation of the Research Proposal in the fall semester 87901 course, the instructor will consult with the student's mentor to select two faculty members who will serve as a Proposal Examining Committee (PEC). The mentor may not serve on the PEC. The student will submit a one-page abstract to the PEC and schedule the exam provisionally, preferably during the January immediately following the course.

2. Based on critical feedback of oral and written proposal presentations in the 87901 course, the student will revise the written proposal and submit it to the PEC and subdiscipline Chairs electronically by January 5th. The dissertation advisor may not offer substantial scientific input but is encouraged to offer advice on organization, style, and grammar. The written research proposal itself should consist of no more than 10 pages excluding references and be prepared using 1.5- line spacing and 12-point font. It must include the following elements:

a Specific Aims: significance of the subject, problem to be solved and/or hypotheses to be tested, objectives of the proposal, and strategy to be used to achieve these objectives.

b Background and Significance: review of the pertinent background literature to place the proposal in perspective and consider alternative investigative approaches.

c Research Plan: techniques, procedures, methods for analysis of the results, expected outcomes and possible pitfalls, projected timeline for major experiments and/or calculations.

d 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 PEC will inform the student within 10 days regarding the suitability of the proposal for oral defense. If the proposal is unsuitable, written feedback will be provided to enable the student to submit a revision within one month. Once the proposal is deemed acceptable, 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 related to the proposal.

5. The PEC will transmit its grade recommendation to the subdiscipline Chair, 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 two weeks. A student who fails the defense for a second time will be dismissed 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 7XXXX-level elective, and one 8XXXX-level elective, as well as to conduct laboratory rotations (79051) through three laboratories during their first year. The 7XXXX and 8XXXX electives and the 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 7XXXX and 8XXXX 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

<i>First Semester:</i>	71000, 75000 and 76000
<i>Second Semester:</i>	78500, 79051, 7XXXX elective
<i>Third Semester:</i>	8XXXX elective and preparation and defense of research proposal.
<i>Fourth Semester:</i>	preparation and defense of research proposal (if not completed during the third semester).

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 8XXXX elective and the 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.

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. Students must write and defend proposal before the end of the fourth year. General guidelines for preparation of the written proposal and the oral defense are given in Section IV.8 of this handbook. 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.

8. 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 in one's subdiscipline 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 chemistry office submits an electronic version of 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. Students are required to meet with the Executive Officer and to establish that all course and other requirements for the sub-discipline have been met. The EO must approve the advancement to candidacy.

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 at the website of the Ph. D. Program in Chemistry (www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Doctoral-Programs/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 members maintain their own websites; links to these can be found at the program's website and the sites for the college Chemistry Departments.

Further introductions to the research of various faculty members will be made during the Friday Seminar Series that will be held for first year students during the fall semester. A minimum of three Rotations in research laboratories of your choice will also be made as part of process of the selection of a mentor. After examining all this material, students must 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.

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 is related to the selection of the subdiscipline in which you intend to concentrate. The subdiscipline selection is made at the end of the first year, when mentor selection is made, after completion of the First Examination. This choice determines the Second Examination you are required to take. If a student wishes to change from one subdiscipline to another at a later time after the first year, 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.

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. Once you have arranged such a transfer, you should immediately notify both the chair of your original department and the Executive Officer.

You should begin speaking with possible research mentors at the conclusion of your first semester. This is usually the time at which the selection of a subdiscipline is made. 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. Students are expected to devote full time to research in the summer months.

2. The Dissertation Committee and Annual Committee Meetings

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 third semester. 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, as well as planning of coursework and other sub-discipline requirements. 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 the 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 'The ACS Style Guide: A Manual for Authors and Editors'. Copies are available in the library or can be purchased from the American Chemical Society. The ACS *Style Guide* 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 (1-212-817-7069) 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.

Footnotes 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 at least 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:

<i>Graduation in</i>	<i>Committee Certification and Request for Scheduling Defense</i>	<i>Successful Defense and Deposit of Dissertation</i>
September	August 15	September 14
February	January 15	January 31
May/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. 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. Hilary Fisher, Director of Sponsored Research, 212-817-7523, for information.

VI. Registration, Tuition, and Fees

1. 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 “Registration and Student Status 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 *Graduate Center 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 *Graduate Center 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 the Graduate Center on behalf of the 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. Acceptable work in research courses such as 81000 normally is given a letter grade.

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

In the first year all Chemistry PhD students are supported via the CUNY Science Scholarships that carry a stipend. Tuition and participation in a health plan are included in the Science Scholarship during the first year. Students do not teach during the first year. Tuition for four additional years is also included in the Science Scholarship. Stipend and participation in a health plan for the four subsequent years originates from a combination of support via the mentor's research grants as well as teaching at the selected campus. Support for four years beyond the first year is anticipated provided

the student is in good academic standing and has a research mentor.

One of the requirements of the Ph.D. Program in Chemistry is that each Ph.D. student acquires 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. Participation in a health plan after the first year typically requires that a student have a teaching assignment.

Other forms of support are available through The Graduate Center and are described in the *Bulletin, Graduate Center Student Handbook*, and "Financial Assistance." These include funds for travel and dissertation support. An application is required as well as accompanying documentation (e.g. acceptance of abstract, or copy of abstract, responsible conduct of research certification, etc.) and must be endorsed by the Executive Officer.

Because graduate course work and dissertation research are the primary responsibilities of doctoral students, students are expected to devote most of their time to these activities. The combination of any teaching responsibilities associated with their financial support at the respective colleges and the research responsibilities are considered to be a full-time occupation. It is therefore understood that students shall not undertake any additional outside employment during their Ph.D. studies. 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.

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 from the Office of the Registrar 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:

- 1) a minimum of 45 credits with an average grade of B
- 2) passing the First Examination, and

3) 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 student must be registered during the semester the degree is granted.

X. 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.

XI. CONTACTS

Chief Diversity Officer and Title IX Coordinator

Edith Rivera, Room 7301; 212 817-7405

504/ADA Coordinator:

Vice President for Student Affairs, Matthew Schoengood, Room 7301; 212 817-7400.

Coordinator, Sexual Harassment Panel:

Professor Michelle Fine; 212 817-8710.

Campus Director of Public Safety:

John Flaherty; Room 9117; 212-817-7761

Ombuds Officer:

Martin R. Gitterman; Room 3311; 212 817-7191. 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 Faculty and Staff Relations:

Yosette Jones Johnson, Room 8403; 212 817-7700.