

Guidelines for PhD Graduate Students in Biochemistry and Molecular Biology

Prerequisites: Prerequisites are the same as those required for the Molecular and Cellular Biosciences Track.

Course Requirements: The following classes are required:

Molecular and Cellular Biosciences Core Courses (MCB 701, 702)
Molecular and Cellular Biosciences Analytical Skills (MCB 700)
Molecular and Cellular Biosciences Electives (three required)
Molecular and Cellular Biosciences Rotation Research (three required)
Scientific Communication (BICM 700, 701) (2 semesters)
Special topics in biochemical literature (BICM 715/710) (4 semesters)
Research (BICM 719,720)

**Sequence of Courses and
Requirements:**

First Year

August

Molecular and Cellular Biosciences Analytical Skills (MCB700)

Fall Semester

Molecular and Cellular Biosciences Core Course I: Macromolecular synthesis, structure and function, gene expression and genetics (MCB701)
Molecular and Cellular Biosciences Electives (one)
Molecular and Cellular Biosciences Rotation Research (one in fall, one in winter)

Spring Semester

Molecular and Cellular Biosciences Core Course II: Cell structure, cell communication, organ systems integration, physiology and pharmacology (MCB702)

Molecular and Cellular Biosciences Elective (two)
Molecular and Cellular Biosciences Rotation Research

Choose Advisor

Second Year

Fall Semester

Scientific Communication (BICM 700, 701)

Special topics in biochemical literature (BICM 715/710)

Elective: at least 3 credits. May be fulfilled by two MCB electives that were not taken in the first year or any other elective. May be taken in the fall or spring of the second year.

Research (BICM 719,720)

Collateral course(s) based on interest

Choose Advisory Committee

Spring Semester

Scientific Communication (BICM 700, 701)

Special topics in biochemical literature (BICM 715/710)

Research (BICM 719,720)

Submit Outline for the Preliminary Exam Proposal

Summer

Preliminary Exam must be completed by August 1

Third Year

Special topics in biochemical literature (BICM 715/710)

Research (BICM 719,720)

Research Seminar, once per year

Committee meetings, at least once per year

Tutorials, depending on interests and as recommended by Advisory Committee

Subsequent Years

Research (BICM 719,720)

Research Seminar, once per year

Committee meetings, once per year
Thesis seminar: given in the student's final year
(required)

Collateral Courses: In the second year, a collateral (elective) course(s) is chosen by the student based on research interests and in consultation with the Program advisor. A total of at least 3 credit hours are required. The student may choose 2 MCB electives (2 credit hours each), or any other elective. In subsequent years, additional elective courses may be selected by the student with the advice of his/her advisor and committee; however, these are not required, although they are encouraged as a means to augment the student's education in selected areas of focus. Collateral courses may also be used to provide additional background in areas identified by the student's committee.

Laboratory Rotations: These consist of individualized laboratory projects carried out under the supervision of a full faculty member in the department. The student selects three different laboratories over the course of the academic year in order to enhance the research experience. Laboratory assignment depends upon the student's preference and the availability of a position in the chosen laboratory. Students are encouraged to present the results of their research to their research group at the end of each rotation.

Seminars: After the first year, all students are required to attend the Biochemistry departmental and student seminar series and to present their research at the student seminar series once per year. Students are also encouraged to participate in professional development activities and symposia sponsored by the graduate school and various basic science departments. Advanced students who expect to graduate within a year may, with the permission of their advisor, request to be taken out of the normal seminar rotation, so that their last seminar is their defense (see last section on Conclusion of Studies).

Special topics in biochemical literature: All second and third year students will participate in Special Topics in Biochemical Literature, a class devoted to examination of the primary literature. Participation in this class is intended to develop skills required for critical reading and interpretation of the scientific literature.

Academic Standing: The faculty will review each student's progress at the end of every semester to determine whether he/she will be permitted to

continue. To remain in the Ph.D. program, a student must maintain a grade-point average of at least 2.5, unless an exemption is granted by the faculty. Students who have completed the Preliminary examination must maintain grades of Satisfactory in research. Students who receive two sequential grades of Unsatisfactory will be recommended for dismissal from the Program.

If a decision is made to terminate a student in the Ph.D. program, the individual may be given the option to complete the M.S. degree program. The procedure for obtaining the M.S. degree is as follows. The student will obtain the approval of his/her advisor and committee to pursue the M.S. degree. The committee will define an acceptable timetable for the completion and defense of the master's thesis, and the committee chair will notify the Biochemistry Program Director of this action. The student will obtain letters supporting the decision to pursue the M.S. degree from his/her advisor and the Graduate Program Director, and submit them together with a written request to the Dean of the Graduate School. If permission to pursue the M.S. degree is granted by the Dean, the student will proceed to write and defend a master's thesis. The student must have also completed all graduate school requirements as defined in the Graduate School Bulletin. As in the case of the doctoral thesis, all committee members must be present at the defense.

In unusual cases, a student may wish to voluntarily withdraw from the Ph.D. program before the completion of the Preliminary Examination. If the student has satisfactorily completed departmental requirements through the fall semester of the second year, and all graduate school requirements as defined in the Graduate School Bulletin have been satisfied, such a student may be given the opportunity to complete the M.S. degree program. The procedure is as follows: The student will first obtain the approval of his/her advisor to pursue the M.S. degree. If the student has not already assembled an advisory committee, an advisory committee will then be appointed by consultation between the advisor and the student. The advisory committee shall consist of the advisor, one other faculty member of the department, and a member of the graduate faculty from outside the department representing a related area of research. The student will meet with the advisory committee and obtain its approval to pursue the M.S. degree. The committee will define an acceptable timetable for the completion and defense of the master's thesis, and the committee chair will notify the Biochemistry Program Director of this action. The student will obtain letters supporting the decision to pursue the M.S. degree from his/her advisor and the Graduate Program Director, and submit them together with a written request to the Dean of the Graduate School. If permission to pursue the M.S. degree is granted by the Dean, the

student will proceed to write and defend a master's thesis. As in the case of the doctoral thesis, all committee members must be present at the defense.

Choice of Faculty Advisor and Advisory Committee: The student will be assigned an advisor before the end of the second semester of the first year. This assignment will be based on a ranking of choices submitted by the student to the Graduate Program

Director. In preparation for making these choices, the student should attend faculty research presentations and consult with faculty individually about specific research problems. In addition, the student should use the course Introduction to Molecular and Cellular Biosciences Research (MCB 703, 704, 705) to evaluate prospective laboratories. All full faculty members in the program are eligible to be the thesis advisor if adequate time and resources are available to devote to the student. These criteria will be determined by consultation between the student, the proposed advisor, the Graduate Program Director and the Department Chair.

After choosing a faculty advisor, an advisory committee will be appointed by consultation between the advisor, the student, and the Graduate Program Director. The advisory committee should consist of the advisor, two other members of the department, a member of the graduate faculty from outside the department, and a fifth member, from within or outside the department, representing a related area of research. If desired by the student and the advisor, additional faculty-level scientists may be appointed as committee members. The committee should be appointed by the beginning of the student's third semester and will subsequently meet with the student once a year to assess his/her progress. Conclusions reached at these meetings will be documented in writing through the filling out of a specific form. [It is the responsibility of the student to obtain this form](#) from the Departmental Secretary and to distribute it to the committee chair prior to the beginning of the meeting. At the conclusion of the meeting, the committee chair will fill out the form, and review it with the advisor and student. A copy will be placed in the student's file and also provided to the advisor, student, and Program Director. The objective is to provide clarity as to the conclusions that were reached at the meeting, and to document those conclusions for the benefit of the student and faculty. The form is attached as Appendix I to these Guidelines.

The chair of the preliminary examination committee should be a departmental faculty member other than the faculty advisor. It is the responsibility of the chair of the preliminary examination committee to determine that the student has met all departmental requirements. This committee generally serves as the final

examination committee. The committee member from outside the department serves as chair of the final examination committee and determines that all graduate school requirements are fulfilled.

PRELIMINARY EXAMINATION

The Ph.D. preliminary examination must be completed by August 1 of the second year, after the student has passed required courses. The Ph.D. examination consists of (1) passing all the required courses with a final grade of B or better, (2) oral defense of a written research proposal.

If a student does not pass a required course with a grade of B or better, the faculty may decide to allow him/her to retake the course to make up the deficiency and remain in the Ph.D. program. A failure to pass the retake with a grade of B or better disqualifies a student from continuing in the Ph.D. program. In this situation, the student has the option of requesting a hearing with the Biochemistry faculty. The chair of the graduate program committee meets with the student to discuss the case and presents the case to the faculty at this hearing. After all pertinent information on the student's past performance in didactic and laboratory work is heard, the faculty votes to determine if special action will be taken to allow the student to try again for candidacy. A two-thirds positive vote by the faculty permits this special action to proceed.

Remedial studies and subsequent performance requirements for the student are established by the faculty on a case-by-case basis.

Research Proposal: Each student will submit a proposal of the research that will be performed for the Ph.D. thesis. The proposal will be in the form of a NIH research grant as outlined in detail below. Students are encouraged to seek assistance from their advisor, the advisory committee, and other faculty during the preparation of the proposal. The mentor or other faculty should offer suggestions if the proposal is unclear or needs expansion (more background, references, illustrations, etc.). Approaches to achieving the specific aims should be discussed. However, it is inappropriate to tell the student in detail how to correct deficiencies or to detail specific technical approaches.

Examination Committee: The examination committee for the preliminary examination will consist of the members of the student's advisory committee. The function of the committee is to determine acceptability of the student for advancement to degree candidacy by critically evaluating the scientific quality of the project, the clarity of the written proposal, the completeness of the literature

survey, and the student's originality and understanding of relevant biochemical concepts.

Dates and Deadlines: The Preliminary Examination must be completed by August 1 of the second year, but may be completed as early as the Spring semester of the second year if the student and his/her committee agree. If the student is unable to complete the Ph.D. examination by August 1, she/he may request a hearing prior to August 1 of the Graduate Program Committee. The student will explain the reason for the inability to meet the deadline. If the Committee decides that the student's explanation is insufficient to warrant an extension, the student will receive a grade of Unsatisfactory for research in that semester, and will be placed on academic probation. The student will be given a new deadline for completion of the examination. If this second deadline is not met, a recommendation for dismissal will be made. If at the initial hearing the Committee decides that the student has provided sufficient reason for an extension, one extension may be granted. Subsequent procedures will be as described above. If the examination is not completed by August 1 and an extension has not been requested, the student will receive a grade of Unsatisfactory for research in that semester. Two sequential grades of Unsatisfactory will result in recommendation for dismissal from the program.

Timeline for completion of the Preliminary Examination. An example of a timeline for completion of the Preliminary Examination provided below. The student will have 6 weeks to write the Preliminary Exam. Details of each event are provided in subsequent paragraphs.

Time	Event
9 weeks before exam	Student submits written outline to committee
8 weeks before exam	Outline meeting
2 weeks before exam	Student submits the written Research Proposal
1 week before exam	Committee notifies student if written proposal is acceptable for oral defense
	Oral exam

Outline meeting. The date set for the oral exam (prior to August 1) will determine when all other deadlines fall. Nine weeks before the date of the oral exam, the student will submit an outline of the proposal. One week later, the examining committee will meet briefly with the student to discuss the

acceptability of the outline and to make suggestions (the "Outline Meeting"). As a general guideline, this meeting is expected to last approximately one hour, including an approximately 20 minute oral presentation by the student. Students are expected to be able to provide some broader context for their proposal, explain the logic and rationale for the experiments they have outlined, and in general terms explain the experimental approaches that will be used. The purpose of this meeting is to guide the student in preparing for the oral examination. It is appropriate to give examples of the issues that will be raised. However, detailed questioning and defense of the proposal should be reserved for the oral examination. If there are no major problems, the student may proceed to complete the written proposal. If the proposal as outlined at this meeting is judged unsatisfactory, the student may either be advised to submit a revised written outline that will be discussed at a future meeting, or, if requested revisions are not extensive, be permitted to proceed to write the full proposal. If the committee requests a revised written outline, the committee will set a date for receipt of the revision (generally 2-3 weeks) and clearly indicate in writing the revisions requested. A second "outline" meeting will be called. If a revised written outline is requested by the examining committee, this will be considered an acceptable reason for extension of the August 1 deadline. The Chair of the committee will notify the Graduate Program Director of the new deadline. If the revised outline is unacceptable, the student will be considered to have failed the Preliminary Exam, and the procedures outlined below will apply.

Written and Oral Preliminary Exam. Two weeks before the oral exam, the student will submit the completed written proposal. Within 1 week, the examining committee will inform the student if the written proposal is acceptable for oral defense. If not, the committee will provide a detailed written critique and set a date for receipt of a revised proposal, usually within 2-3 weeks. If a revision is recommended by the examining committee, this will be considered an acceptable reason for extension of the August 1 deadline. The Chair of the examining committee will notify the Graduate Program Director of the new deadline. If the revised proposal is unacceptable, the student will be considered to have failed the Preliminary Exam. The student will not proceed to the oral exam, and the procedures outlined in the next paragraph will apply.

If the proposal is judged acceptable, the oral exam will proceed as scheduled. The exam will begin with a brief (approximately 20 minute) presentation by the student, followed by questioning by the committee. As a general guide, the length of the entire exam is expected to be approximately 2

hrs. Following the exam, a decision on acceptability of the student for admission to degree candidacy will be made by the committee. If a member of the Examination Committee is unexpectedly unable to attend the oral exam (due to illness, for example), the Committee chair may appoint a suitable substitute, or reschedule the exam. In the event that a student does not pass the oral exam, the examining committee can recommend that the student be refused admission to candidacy for the Ph.D. program or that reexamination be allowed no earlier than six months from the date of the first exam. A student may be reexamined only once. If the committee does not recommend the student for advancement to Ph.D. candidacy, the student may, at the discretion of the faculty, have the option to complete the M.S. degree program. The chair of the committee will inform the Graduate Program Director of the outcome of the preliminary exam. The Graduate Program Director then informs the graduate office.

OUTLINE FORMAT The outline should be no longer than two pages (single-spaced) and should consist of the following sections.

Specific Aims: A concise statement of the specific research objectives, including the hypotheses to be tested.

Justification: Explain the significance of the project and its originality, placed in the context of a brief summary of previous work done in the area.

Research Plan: Summarize experimental design to be used to address the specific aims, including methods to be used.

FINAL PROPOSAL FORMAT

The final proposal is patterned after NIH R01 guidelines. Proposals length is no more than 12 single-spaced pages, not including Specific Aims page or references. Font should be Arial 11. Typing will not be done by departmental secretaries on department time. The proposal should be clearly written in the student's own words and should be carefully proofed for spelling and grammatical errors. The final proposal should consist of the following sections:

Abstract: (1/2 page). A short summary of the problem and the goals of the project.

Specific Aims: (1 page). A concise statement of the specific research objectives, including the hypotheses to be tested.

Significance and Innovation (1-3 pages): A summary of the literature describing the present status of the field. The background section should place the proposed research in proper context. The significance and value of the proposed research should be included in this section.

Research Strategy (9-11 pages): Experiments and methods to be used to address the specific aims with a description of the results expected. Preliminary data can be included here. This section should identify any special problems that are anticipated and describe alternatives.

References: Techniques to be used and all work and ideas of others should be properly referenced. References should include titles and follow a format approved by the committee.

Student committee meetings. Graduate students are required to have annual meetings with their committee. The student is responsible for obtaining a copy of [this form](#) from the Biochemistry office before each committee meeting and giving it to the committee chair prior to the beginning of the meeting. The student is also responsible for distributing an updated copy of his or her CV to the committee at the beginning of the committee meeting. Following each committee meeting, the committee chair will summarize the results of the meeting on this form. The form will be reviewed with the student, and signed by the student, advisor and committee chair. The signed form will be returned to the Biochemistry office. Copies of the form will be placed in the student's file and distributed to the student, advisor, and Program Director.

Conclusion of Studies: Dissertation and defense

When the student and advisor agree that the student is approaching the completion of his/her studies, a committee meeting will be called. At that meeting, the student will outline his/her trajectory for completion of experimental work and writing of the thesis. This will include an outline of experiments to be completed and a tentative timetable. It may be helpful to set a target graduation date, since that date will drive other deadlines. These plans will be discussed and may be modified at the committee meeting. When the student and committee have agreed to a plan, the student will proceed to execute that plan. Additional meetings may be called to modify this plan if problems are encountered or the work does not proceed as anticipated.

When the student is ready to write the dissertation, a final committee meeting may be called to discuss this decision. With the approval of the advisor and committee, the student will set a date for the final thesis seminar. This final seminar is required of all students, and is intended to serve as the final thesis defense (see below). When feasible, this seminar will be scheduled in the existing student seminar series. Detailed instructions for preparation of the dissertation may be found on the graduate school website: <http://graduate.wfu.edu/students/dissertation.html> Four weeks prior to the date set for the final thesis seminar, the student will submit the written dissertation to the Dean of the Graduate School. Three weeks prior to the date set for the final thesis seminar, the student will distribute copies of the written dissertation to members of the committee. Ten days prior to the date set for the final thesis seminar, the committee chair will poll the committee to determine the acceptability of the thesis for the defense. If the committee members are not in unanimous agreement, the committee will meet to determine whether the defense should take place, which will be decided by a majority vote. If the committee votes that the thesis is not acceptable for defense, the committee chair will communicate this to the student. The student will be given a specific deadline for the submission of the revised dissertation and a detailed list of deficiencies. The student will prepare and submit a revised dissertation that remediates these deficiencies. The committee chair will again poll the committee to determine the acceptability of the revised thesis for defense. If a majority of the committee vote that the revision is unacceptable, the student will be dismissed.

If agreement is reached that the thesis is ready to defend and if the written document is approved by the committee, then the oral defense will consist of a final seminar of approximately one hour followed by audience questions. Criteria for a successful defense will be: a) Approval of the written thesis by the committee, pending minor revisions, prior to the oral seminar/defense. b) Satisfactory presentation of his/her research by the student and satisfactory responses to questions during the seminar. A decision concerning whether the student has met these criteria will be rendered by the committee at a brief meeting following the seminar and will be communicated to the student immediately.

If any member of the committee judges that the student did not perform adequately at the oral seminar, then the meeting following the seminar will be extended to allow a full oral exam administered in closed session by the thesis committee. Outcomes of the exam are unconditional pass, pass upon rectifying

deficiencies, and fail. As described in the Graduate Bulletin, a decision to fail the student will require a failing vote by more than one member of the committee. Procedures for resubmission of the thesis will be as described in the Graduate Bulletin. At least 3 members of the dissertation committee will be drawn from the original committee; if the resubmitted dissertation fails to meet requirements, the student will be dismissed.

Guidelines for MS Graduate Students in Biomedical Science Program

Students pursuing MS degree in Biomedical Science will follow the [degree requirements](#) set forth for the Program by the Wake Forest Graduate School. Students are required to select a committee of three faculty members, including the advisor and one other faculty member from the department. The third is a member of the graduate faculty from outside the department representing a related area of research. Students are required to have annual meetings with the committee.