

# BIOCHEMISTRY AND MOLECULAR BIOLOGY

## GUIDELINES AND EXPECTATIONS FOR Ph.D. STUDENTS

### (Years 2+)

## Overview

The goal of the Department of Biochemistry & Molecular Biology is to produce the next generation of highly trained, independent thinking scientists. We are very excited about our Ph.D. program and confident that the Department of Biochemistry & Molecular Biology can offer you the education and graduate research experience that you will need to achieve your career goals.

These rules pertain to all students in the Department of Biochemistry and Molecular Biology (BMB). They are in partnership with the guidelines and requirements set forth by the Program in Molecular and Cellular Biosciences (PMCB), and the Graduate Council of the Oregon Health & Sciences University (OHSU) School of Medicine. All BMB students are responsible for reading this document.

## General Timeline

The Ph.D. program is organized as follows:

Year 1	Complete PMCB requirements
Year 2	Complete the PMCB Qualifying Examination Undertake the research leading to the Ph.D. dissertation Complete required and elective courses
Years 3 +	Attend and participate in Departmental Seminars and a Journal Club Create a Dissertation Advisory Committee (DAC) Advance to PhD Candidacy Continue research leading to the Ph.D. dissertation Attend and present research at Departmental Seminars and a Journal Club of choice closest to dissertation work

## Links

[Basic Sciences Shared Administration Services](#)

[BMB Graduate Program](#)

[OHSU Code of Conduct](#)

## Program Contacts

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## Selection of a Faculty Mentor

The student's selection of a mentor for the doctoral dissertation must be approved by the Director of the student's graduate program and by the Director of the mentor's primary administrative unit.

- a) The Mentor must be a member of the Graduate Faculty.
  - A list of current Grad Faculty members can be found [here](#).
- b) Graduate Program Coordinator completes a [Mentor Assignment form](#), and forwards to the Associate Dean for Graduate Studies.

## Required Courses

Students are required to earn a minimum of 135 graduate-level term-hour credits. At least 100 hours must represent credit hours earned in the Department of Biochemistry and Molecular Biology (hours labeled BCMB).

### REQUIRED BMB GRADUATE COURSES YEAR 2

Fall/Winter/Spring Term

BCMB 605	Journal Club	3 courses
BCMB XXX	Elective credits	1 course
BCMB 607	Departmental Seminar Series	3 courses
CON 665, 667 & 668	Two of these courses must be taken in Year 2 if they were not selected during Year 1 as part of the PMCB required courses	3 credits
BCMB 619	Molecular & Biochemistry Basis of Disease	1 credit*
BCMB 601	Research	11 – 14 credits/term

### REQUIRED BMB GRADUATE COURSES YEAR 3

Fall/Winter/Spring Term

BCMB 605	Journal Club	3 courses
BCMB XXX	Elective credits	1 course
BCMB 607	Departmental Seminar Series	3 courses
BCMB 601	Research	11 – 14 credits/term

Summer Term

BCMB 601	Research	11 – 14 credits
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\*If course not offered substitute one elective course

## 1<sup>st</sup> Year PMCB Courses

A major goal of the Department of Biochemistry and Molecular Biology is to provide its graduate students with a rigorous and complete education in the underlying principles and practice of modern biochemistry and molecular biology.

To do so, the department furnishes a thorough didactic education. In the 1<sup>st</sup> year, students take required conjoint PMCB courses in the Structure and Function of Biological Molecules (CON 661), genetic mechanisms (CON 662), Bioregulation (CON 663), and Molecular and Cell Biology (CON 664). BMB students also study the biophysical chemistry of macromolecules (CON 668). For more information about the PMCB Conjoint Courses, please click [here](#).

## [PROGRAM] Courses

### BMB SPECIFIC COURSE REQUIREMENTS

Students are required to register for, attend and present their dissertation work annually in the Departmental Seminar Series, BCMB 607, held Mondays and / or Tuesdays at noon as well as attend a Journal Club, BCMB 605 (Years 2 through end of program).

## Electives

A total of 3 elective courses are required to be eligible for the Biochemistry & Molecular Biology Ph.D. degree. Students are strongly encouraged to start taking at least one elective course no later than winter term of their second year. The following are only a few of the popular electives taken by the graduate students in BMB. Other courses available are listed in the course catalogue and graduate students are encouraged to speak to their mentor and/or GPD when considering taking other courses. Some elective courses are offered every other year, relative dates are noted below:

BCMB 620	Biochemical & Biophysical Properties of Membranes	2 credits/Winter Term
BCMB 628	Protein Crystallography	2 credits/Winter Term
BCMB 625	Advanced Molecular Bio. & Nucleic Acid Biochemistry	3 credits/Spring Term
BCMB 618	Protein Design: How Structure is Related to the Function of Proteins	3 credits/Winter Term
BCMB 630	Intro to Biophysics (PSU/OHSU joint course)	3 credits/Winter Term
BCMB 631	Adv Biophysics (PSU/OHSU joint course)	3 credits/Spring Term

## Research Credits

Students are required to register quarterly for at least 11 credits of BCMB 601.

## Dissertation Credits

Ph.D. candidates that are approved to begin writing their dissertations are required to register quarterly for at least 11 credits of BCMB 603.

## Seminar

Seminars presented by students, fellows, faculty, and visiting speakers on contemporary topics.

## Journal Clubs

Students are required to enroll in a BCMB 605 Journal Club throughout their graduate tenure, excluding summer term.

## Course Load

Students are expected to register for 16 credits each term until they defend.

## Course Waivers

If a student wishes to be excused from taking a required course, the student and advisor should jointly petition the Graduate Curriculum Committee stating their reasons for wishing to be excused from the requirement. The curriculum Committee will decide the issue by a majority vote.

## Grading

Only course work (required and elective), and not research, journal club or seminar credits, will contribute to the GPA. Students must receive a grade of A or B in the required courses specified in this document. If a student does not receive an A or B, the student must repeat the course the following year. The course can be repeated one time only. Failure to receive an A or B the second time will result in dismissal from the program. The required courses for which this rule applies are CON 650, 661, 662, 663, 664, 665, 667 and 668. The grade of Incomplete is reserved for circumstances in which a student is unable to complete the course requirements the end of the term in which the course is offered due to circumstances beyond their control (i.e. illness) AND it is possible to fulfill the remaining requirements within the subsequent term to earn a grade.

If a graduate student fails a semester of research credits (i.e. receives No Pass (NP) on research), the student is put on immediate academic probation. The student is required to obtain a passing grade on the next term (and subsequent terms) of research credits or the student may be dismissed from the BMB graduate program.

A pre-qualifying graduate student is required to notify and meet with their mentor, graduate program director (GPD) and graduate program coordinator (GPC) immediately upon receiving a failing grade on the research credits in any one term. The GPD will suggest a course of action that the student must follow in correcting their academic performance.

A post-qualifying graduate student (in consultation with their mentor, GPD and GPC) is required to schedule a Dissertation Advisory Committee (DAC) meeting immediately upon receiving a failing grade on their research credits in any one term. This DAC meeting must take place within two weeks of receipt of the failing grade on the research credits. The mentor and DAC will suggest a course of action that the student must follow in correcting their research programs.

The courses BCMB 605 Journal Club and BCMB 607 Seminar require documentation of attendance in order to be considered for the grade of 'Pass.' A total of 3 absences are allowed per term. A graduate student missing more than 3 will receive a grade of 'No Pass' and will be placed on immediate academic probation. The student must receive a 'Pass' the subsequent term and every term thereafter. Following the receipt of the first 'No Pass,' a pre-qualifying exam student must immediately meet with their mentor, GPD and GPC. A plan for insuring the attendance goal for the next term should be designed. Two grades of 'No Pass' in either of these activities disqualifies a student from taking their qualifying exams, resulting in dismissal from the BMB graduate program. If a student who has advanced to candidacy receives two grades of 'No Pass' in either activity they may be dismissed from the BMB Graduate Program.

## Course Descriptions

### BCMB 618 Protein Design: How Structure is Related to the Function of Proteins

Advanced topics that cover the structure, chemistry and function of proteins. Particular aspects of protein biochemistry include: the chemical properties of amino acid side chains, catalysis, levels of protein structural organization, purine metabolic pathways, rational drug design, membrane receptors, extracellular matrix, protein cofactors, kinase, and phosphatase catalytic mechanisms.

### BCMB 619 Molecular & Biochemistry Basis of Disease

An advanced graduate course with an emphasis on the latest research from the primary literature along with in-depth presentation of the basic concepts of biochemistry and molecular biology. Topics will be chosen from areas of expertise among the cancer biology faculty. Topics will include genomics and cancer, genomic instability, and drug discovery.

This class is not a faculty-driven lecture class, but is based on student presentations of background material and research papers selected from the current literature. It is designed to maximize active roles for students in each class.

### BCMB 620 Biochemical & Biophysical Properties of Membranes

The composition of biological membranes and the functional aspects of their composition; models of membrane structure, membrane function, and mechanisms of membrane transport.

### BCMB 625 Advanced Molecular Bio. & Nucleic Acid Biochemistry

Provide updated information and knowledge about biochemical and molecular activities on chromatin and nucleic acids; transcription initiation, activation, silencing, chromatin assembly and remodeling, DNA damage and repair, RNA processing and editing, and coupling of transcription to cellular events.

### BCMB 628 Protein Crystallography

No description available

### BCMB 630 Intro to Biophysics (PSU/OHSU joint course)

Biophysics involves the application of physical techniques to achieve an understanding of life processes at a molecular level. Physical techniques are central to the measurement of the atomic structure, dynamics and interactions of molecules that are a core foundation of modern molecular biology, while physical theory governs the predicted behavior of biomolecules and helps us achieve a mechanistic understanding of how they work. Thus, biophysics is a central science in the fundamentals of normal physiology, molecular pathology, and in the development of pharmaceutical remedies for a wide range of diseases.

This is the first of two lecture courses that will prepare graduate and advanced undergraduates for research and professional work in Molecular Biophysics. It will cover macromolecular structure and underlying atomic interactions, and the thermodynamics and kinetics through which function is understood, using membrane proteins as an example. It will then introduce three of the experimental technologies used to elucidate structure and dynamics: Crystallography, Spectroscopy and Magnetic Resonance.

At the conclusion of this course, students will have the theoretical foundation to understand the properties of macromolecular functions, and understand the principles by which their actions are simulated. Students will be able to critically assess primary literature written for a general scientific audience in the area of macromolecular structure & function, understanding the experimental basis in crystallography, NMR and spectroscopy. Students will also be prepared for the Advanced Biophysics course which would be the entry point into practical application of biophysical techniques.

### BCMB 631 Adv. Biophysics (PSU/OHSU joint course)

Biophysics involves the application of physical techniques to achieve an understanding of life processes at a molecular level. Physical techniques are central to the measurement of the atomic structure, dynamics and interactions of molecules that are a core foundation of modern molecular biology, while physical theory governs the predicted behavior of biomolecules and helps us achieve a mechanistic understanding of how they work. Thus, biophysics is a central science in the fundamentals of normal physiology, molecular pathology, and in the development of pharmaceutical remedies for a wide range of diseases.

This is the second of two primarily lecture courses that will prepare graduate and advanced undergraduates for research and technical work in Molecular Biophysics. It will cover the practical aspects of the elucidation of macromolecular structure and dynamics by NMR spectroscopy and x-ray crystallography, and the characterization of macromolecular interactions by electron microscopy, mass spectrometry and fluorescence methods. It will examine computational methods for interpreting structure, predicting properties and simulating mechanisms of action.

At the conclusion of this course, students will have a working understanding of the primary experimental and computational methods by which the structure, dynamics and interactions of biomolecules are elucidated and their actions simulated. Students will be able to critically assess primary research literature written for a general scientific audience that uses any of the common physical approaches to understand macromolecular systems. Students will understand the nature of advances that can be made with the principal techniques and their limitations. They will also be prepared for mentored practical research investigations that use the primary methods.

## Academic Progress

### Training in the Responsible Conduct of Research

The National Institutes of Health requires continued ethics training for all trainees, fellows, participants, and scholars receiving support through any NIH training, career development, research education, and dissertation research grant ([NOT-OD-10-019](#)). To meet this requirement, all graduate students are required to:

- Complete CONJ 650 The Practice and Ethics in Science during their first year
- <<requirement for ongoing ethics training>>

### Qualifying Exam

#### Overview

The purpose of the Qualifying Examination in BMB is two-fold. First the examination will determine if the student has acquired sufficient knowledge and skills to pursue their Ph.D. dissertation work. Second, the exam will provide the student with the opportunity to practice the preparation of a research proposal.

#### Eligibility

Before taking the candidacy examination, the student must have completed the BMB course requirements. In the event that a course is not offered before the end of the second year, and the student is otherwise prepared to take the candidacy examination, the examination may proceed without completion of the course and with approval from the Graduate Education Committee. However, the required course must be taken prior to the dissertation defense.

#### Timeline and Description

Each student is expected to complete the Qualifying Examination by no later than the end of the summer term (this is not true for a re-examination) of their second year in the program, in compliance with the PMCB requirements.

On or before July 13 of their second year, students must submit two abstracts to the Graduate Program Coordinator.

July 19: The Graduate Program Director will select a Qualifying Examination Committee (QEC) responsible for conducting the student's qualifying examination. A chair of the QEC will be designated. The student is notified of the names of the panel members.

July 26: The QEC notifies the student in writing of selection of the examination topic and the acceptance or of any weaknesses or specific suggests for improvement to their proposal.

August 6: Students must have their examination dates scheduled. Examinations must be completed at least ten days before the beginning of the Fall term.

Students submit their final written proposal to the QEC and their dissertation advisor at least one week prior to the Examination date. Students must submit a letter to the QEC from their dissertation advisor describing the advisor's role during preparation of the proposal (see "Role of Thesis Advisor and Other Faculty" in the PMCB guidelines).

## Qualifying Exam Committee

The Graduate Program Director will appoint a 5-member examination committee for each student based on the topic to be presented by the student and, as they see fit, the nominations of the student involved. Names of the examiners nominated by the student should be submitted to the Graduate Program Director together with the abstracts of their proposals.

## Role of Advisor/Mentor

The student's Mentor may not serve on the examining committee, and may not attend the examination as an observer.

## Format of Written Proposal

Note: BMB guidelines are in accordance with PMCB written guidelines with minor differences that are outlined and bolded.

Written examination: The qualifying examination will consist of written research proposal prepared by the student within their general area of research, but not directly on the student's research project, followed by an oral examination. The proposal should use the general format of the "Research Plan" section of an NRSA grant (<http://grants.nih.gov/grants/funding/phs398/phs398.html>). The research plan should have the substance and content, including original thinking, appropriate for such an application. That is, it shall have the following sections:

1. Specific Aims
2. Background and Significance
3. Experimental Design and Methods
4. Literature Cited

The significance, feasibility and the relationship of the proposal to current literature will be important criteria for evaluation. The reference listings must include citations of original papers from the literature. Website addresses may be included as a supplement. The total length of the proposal is limited to 7 single-spaced pages using a 12-point font and/or no more than 15 characters per inch and ½ inch margins. Proposals submitted in an inappropriate format will be returned to the student for reformatting, which will delay the qualifying examination.

## Format of Oral Exam

The oral examination will probe the breadth of the student's knowledge and also the depth of the student's understanding of his/her research proposal. The student is expected to begin the oral examination by giving a short (20-30 minute) formal presentation summarizing the written proposal. Audio-visual aids may be used. Questions from the Qualifying Examination Committee should focus primarily on issues pertaining to the proposal; however, the student is responsible for all areas of cellular and molecular biology that have been covered during the first two years of graduate study. Therefore, students also should expect questions on general knowledge in addition to questions relating to the scientific background pertinent to their areas of specialization, as well as more general issues related to the proposed experiments. Student should be prepared to discuss the rationale for the proposed study, the strengths and limitations of the proposed experimental strategies and the potential pitfalls and alternative.

Before embarking on preparation of a research proposal, **the student will submit two abstracts** of approximately 300 words each to the Graduate Program Coordinator (GPC). The abstracts should describe specific research problems which have been designed by the student and **which may be related to but not directly on the student's dissertation research**. Abstracts will be reviewed and the Qualifying Examination Committee (QEC) will select one topic for development. If the QEC deems none of the proposals suitable, the student will present additional proposals in a time frame designated by the QEC.

During the preparation of the proposal, the student is encouraged to seek constructive criticism by others, however excluding the dissertation advisor. During the oral examination, the student will be expected to make a 20-30 minute



presentation of the research proposal, which will be followed by questioning that may cover all areas of biochemistry and molecular biology relating to the proposal.

## Outcomes

Pass (Unconditional)

Pass (Conditional)

Students who pass the examination conditionally will be required to complete additional work (e.g. rewriting of the proposal, re-examination by the Examination Committee on basic knowledge). The additional work, and date by which it must be completed, will be specified in writing by the chair of the Examination Committee.

Fail (Retry)

Upon the recommendation of the Examination Committee, a student who fails the candidacy examination may be given the option of taking a second examination. The second Examination Committee will either pass the student or recommend that the student not be admitted to candidacy for the Ph.D. degree.

Fail (Final)

## Timeline for Re-examination

**A student who is asked to repeat the candidacy examination will be expected to do so within 3 months of the initial examination.**

## Advancement to Ph.D. Candidacy

Students will Advance to PhD Candidacy once they have passed their Qualifying Examination *and* have formed their Dissertation Advisory Committee.

## Dissertation Advisory Committee

The purpose of the Dissertation Advisory Committee (DAC) is to advise and oversee the progress of the student's entire graduate education and training. The Committee should be composed of two or more primary faculty members of the Department of Biochemistry and Molecular Biology, and faculty members with primary appointments outside of BMB with appropriate research expertise, to total four members. *The Chairperson of the committee cannot be the Student's Research Advisor (mentor).* If the focus of the student's research changes, then appropriate changes of personnel in the DAC can be made. The DAC should advise the student in matters of curriculum requirements and research objectives. The DAC will determine whether the required coursework has been taken and may recommend additional coursework pertinent to the specific research goals. Members of this committee may also serve subsequently on the Dissertation Examination Committee. In this way, these faculty members will be familiar with research, and will have the opportunity to communicate possible concerns they may have about your work early to allow time to address these concerns. DAC meetings usually involve an oral presentation by the student of dissertation research goals and progress.

## DAC Formation

Immediately following passing the Qualifying Examination, students in consultation with their Mentor should construct a Dissertation Advisory Committee. Students must meet with their DAC within 6 months of passing the Qualifying Examination, and every 6 months following the first meeting. *It is the responsibility of the student to organize and schedule these meetings*

**The First Meeting:** Students are encouraged to form their DAC as early as possible, but the first formal meeting must be held by the end of Winter Term in the student's third year. At least one week prior to the first meeting, the student will be expected to send the Committee Members an updated half-page description of their immediate research goals, a copy should also be sent to the Graduate Program Coordinator (GPC) along with a list of the DAC members and the DAC meeting date. At the first meeting, the student will present a 5-minute introduction to the research problem and one



member of the committee will be selected to serve as chair of the committee. *It is the responsibility of the student to schedule this meeting.*

**Subsequent Meetings:** The DAC will meet every 6 months, or more frequently if deemed necessary. The student will update the committee on the progress made toward the research objectives and the completion of required course work. At least one week prior to the meeting, the student will be expected to send the DAC members and the GPC an updated summary that should be no more than three pages. The meeting will begin with the student giving a 15-minute overview of his/her more recent results and future directions. Following each committee meeting, the Chair should prepare a brief memo evaluating the student's progress and send it to the GPC.

**Final Meeting:** Three to four months prior to anticipated defending their dissertation, the student will have a DAC meeting to obtain approval to begin writing of their dissertation.

**Non-compliance:** Non-compliance can and will result in the revocation of certain Departmental privileges (e.g. Student's Departmental e-mail account), academic probation and possible dismissal from the graduate program.

**BMB Preparation and Submission of Dissertation:** All instructions and guidelines adopted by the Graduate Council By-Laws shall be carefully followed.

## Ethical and Professional Behavior

Graduate students are expected to maintain high ethical standards. Graduate students should demonstrate honesty in all aspects of research activities. Student should learn about and avoid sources of error in scientific research. It is essential that student do not misrepresent scientific findings or misappropriate credit. All graduate students are required to take a course concerning ethics and science. Students should show cooperation, responsibility, and respect in working with other students and faculty. Students should be considerate of the cultural and individual diversity of their colleagues.

Students who are involved in unethical or unprofessional conduct such as cheating, misrepresentation of research findings, plagiarism (failure to credit the original author), or disruption of the learning process are subject to disciplinary action including dismissal from the department.

It should also be noted that students observing unethical behavior by students, faculty, or others on campus are obligated to bring these transgressions to the attention of the appropriate person.

See the [OHSU Code of Conduct](#) for further information.

## Graduate Student Stipends

Students in BMB receive a monthly stipend for living expenses. Students will receive an increase in their stipend payment only after they have passed their Qualifying Exam, formed their DAC and submitted the Advancement to Candidacy form to the GPC. The increase will begin the month following submission of the form.

## Time Limit for Completing Degree Requirements

The time limit from matriculation to granting the PhD degree shall be limited to 28 consecutive terms (seven academic years) unless waived for a leave of absence under the By-Law Article IX Section K.

## Extracurricular Employment

The Program in Biochemistry & Molecular Biology considers employment as a graduate student in the Ph.D. program to represent full time employment. Students are strongly discouraged from seeking outside employment or concurrent enrollment in other degree granting programs. Any student wishing to pursue outside employment or enrollment in a

degree granting program must submit a written request to the DAC, mentor, and the Director of Graduate Program. The student must receive written authorization from the above entities prior to accepting employment or enrollment in a degree granting program. Failure to do so may result in academic probation. If the student is unsure if their intended activity falls into this category, they are advised to discuss the matter with their mentor.

## Grievances

The procedure for handling grievances is outlined in the OHSU Graduate Studies Handbook.

## Exceptions

No exceptions from the policies and procedures described in these guidelines can be made without approval by the BMB faculty. In matters related to coursework, exceptions must be approved by the BMB Graduate Curriculum Committee before review and consideration for approval by the BMB faculty.