BCMB Student Handbook 2025

The Biochemistry, Cellular and Molecular Biology (BCMB) Ph.D. and M.S. graduate programs at Central Michigan University provide research-based multidisciplinary training in diverse aspects of biological, biochemical, and biomedical sciences.

BCMB is an interdepartmental program linking together CMU faculty with research interests in the areas of biology and biochemistry at the molecular and cellular levels. The program's aim is to provide high quality instructional and research experiences for students. Students completing the program will develop knowledge and research skills necessary for success in further scientific or professional education, or to enter the professional workforce in industry, in academia, in government laboratories, or other careers.

This handbook is intended to provide information for BCMB students, their advisors, and members of their committee, with respect to the structure and expectations of the program.

Required forms, including the BCMB Rubric, are located on the BCMB Students MS Teams site or at the Office of Graduate Studies website.

The BCMB committee will review and update this handbook every 1-2 years.

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BCMB Program Information from the Academic Bulletin

M.S. PROGRAM REQUIREMENTS

Required Courses I (10-11 hours)		
SCI 710	Biomolecular Structure and Function-Proteins and Nucleic Acids	4
SCI 720	Advances in Cell/Molecular Biology and Genetics	4
SCI 731	Biochemistry, Cell and Molecular Biology Colloquium	1-2
SCI 740	Research Ethics and Responsible Conduct of Research	1

Required Courses II (1-4 hours)		
SCI 760	Biochemistry, Cell and Molecular Biology Student Seminar (no more than 1 credit can be taken per semester)	1-12

Electives (6-10 hours)		
Select from the following in consultation with the student's advisor and committee:		
SCI 750	Directed Research in Biochemistry, Cell and Molecular Biology	1-30
SCI 770	Careers in Biomedical Sciences	1
Biology: 500-700 level BIO courses		
Chemistry: 500-600 level CHM courses		
Mathematics and Statistics: 500-700 level MTH and STA courses		
Other graduate-level courses recommended by the advisor and approved by the committee.		

Thesis (9 hours)		
SCI 799	Master's Thesis	1-9

Total: 30 semester hours

PH.D. PROGRAM REQUIREMENTS

Required Courses I (11-12 hours)		
SCI 710	Biomolecular Structure and Function	4
SCI 720	Advances in Cell/Molecular Biology and Genetics	4
SCI 731	Biochemistry, Cell and Molecular Biology Colloquium	1-2
SCI 740	Research Ethics and Responsible Conduct of Research	1
SCI 761	Biomedical Grant Writing	1

Required Courses II (7-12 hours)		
SCI 760	Biochemistry, Cell and Molecular Biology Student Seminar (no more than 1 credit may be taken per semester)	1-12

Electives I (6-21 hours)

Select from the following in consultation with the student's advisor and committee:

SCI 770	Careers in Biomedical Sciences	1

Biology: 500-700 level BIO courses

Chemistry: 500-600 level CHM courses

Mathematics and Statistics: 500-700 level MTH and STA courses

Other graduate-level courses recommended by the advisor and approved by the committee.

Electives II (3-24 hours)		
SCI 750	Directed Research in BCMB	1-30
SCI 791	Special Topics in Biochemistry, Cell and Molecular Biology	1-9

Dissertation (12 hours)		
SCI 899	Doctoral Dissertation	1-12

Total: 60 semester hours

Expected timeline to graduation for M.S. and Ph.D. students

M.S. Students:

Normal progress toward the degree means that you are expected to move through a series of milestones necessary to obtain your M.S. at a reasonable pace and level of performance. Under normal circumstances, the standard established for the time period in which students are expected to complete requirements for the M.S. is two years. To complete the M.S. in two years, the following timeline serves as a guide for the timing of achievement of the required milestones.

Year 1

- Coursework (core courses + electives)
- Research
- Within 30 days of joining your lab, complete and discuss Year 1 IDP with your advisor
- Form Advisory Committee by end of 1st semester
- Submit written prospectus (after approval of Research Advisor) to Advisory Committee at least 2 weeks prior to oral presentation of prospectus.
- Meet with Advisory Committee regarding research and academic plans and to present the prospectus. In most cases this meeting will take place early in the second semester (before Feb. 1), but it must be no later than the end of the second semester.
- Submit 1) written prospectus and 2) signed prospectus form to the BCMB coordinator and the Office of Graduate Studies by the end of the second semester. For students applying for GTA appointments/reappointments, their prospectus and signed prospectus form must be on file by **February 1** (for students entering in Fall or Summer) or **October 1** (for students entering in Spring).

Year 2

- Coursework (core courses if needed + electives)
- Research
- Complete and discuss Year 2 IDP with your advisor over the summer (deadline Sept. 1)
- Meet with Advisory Committee during the third semester
- At fall Advisory Committee meeting, set target date for completion of M.S. research
- 3-6 months prior to anticipated defense date, hold Committee meeting to obtain approval to defend from Advisory Committee. Approval includes meeting required levels on BCMB Graduate Student Rubric (see Rubric section of handbook).
- Submit written thesis (after approval of Research Advisor) to Advisory Committee at least 2 weeks prior to thesis defense
- Schedule thesis seminar and defense at least 2 weeks ahead of time
- Oral defense of the M.S. thesis (public talk; private questions from faculty)
- Make any changes to the written thesis that were agreed on with your Advisory Committee
- Submit paperwork to BCMB coordinator and the Office of Graduate Studies

Ph.D. Students:

Normal progress toward the degree means that you are expected to move through a series of milestones at a reasonable pace and level of performance. Under normal circumstances, the standard established for the time period in which students are expected to complete requirements for the Ph.D. is five years. To complete the Ph.D. in 5 years, the following timeline serves as a guide for the timing of achievement of the required milestones.

Year 1:

- Coursework (core courses + electives)
- Research
- Within 30 days of joining your lab, complete Year 1 IDP and meet with your advisor to discuss your IDP
- Form Advisory Committee by end of 1st semester
- Meet with Advisory Committee regarding research and academic plans during the second semester

Year 2:

- Coursework (core courses if needed + electives)
- Research
- Complete and discuss Year 2 IDP with your Advisor over the summer (deadline Sept. 15)
- Meet with Advisory Committee in third or fourth semester, such that committee meetings in the first two years occur every 6-9 months
- Write thesis proposal, in consultation with your Advisor. The most common timeline for proposal writing is to begin writing in the spring semester and then use the Biomedical Grant Writing class (SCI 761) to help polish the proposal.
- Submit written thesis proposal to the Advisory Committee *at least 2 weeks prior to oral defense of the proposal*
- Oral defense of the proposal before the beginning of Year 3. Written proposal and oral defense constitute the Qualifying Exam. Successful completion of the Qualifying Exam includes meeting required levels on BCMB Graduate Student Rubric (see Rubric section of handbook).
- Submit a 2-page portion of the written proposal and a signed “Prospectus” form to the Office of Graduate Studies.
- Submit “Advancement to Candidacy” paperwork to BCMB coordinator
- Advance to Candidacy for the Ph.D.

Years 3-4:

- Continue to work on research project
- Complete and discuss Years 3-5 IDP with your Advisor by Sept 15 each year
- Meet with Advisory Committee at least once per year

Year 5:

- Complete and discuss Years 3-5 IDP with your Advisor by Sept 15
- Schedule an Advisory Committee meeting 3-6 months in advance of the anticipated

defense date. The Advisory committee will decide whether student is ready to write the dissertation, including meeting required levels on BCMB Graduate Student Rubric (see Rubric section of handbook); if the student is not yet ready, a specific set of goals to complete the research project should be outlined and a timeline to completion should be discussed

- Prior to submission of written dissertation and scheduling of the oral defense of the dissertation, an outside member will be added to the committee (see Committee Guidelines section of handbook)
- Schedule dissertation defense ~2 months in advance
- Submit written dissertation (after approval of Research Advisor) to Advisory Committee *at least 2 weeks prior to dissertation defense*
- Oral defense of the dissertation (public talk; private questions from faculty)
- Make any changes to the dissertation that were agreed to by your Advisory Committee
- Submit paperwork to the Office of Graduate Studies and BCMB coordinator

Forms Required

This table is a summary of the forms required at each step of the BCMB program. It is the student's responsibility to distribute the forms. Questions about the forms should be directed to the student's Advisor and/or the BCMB coordinator. Most forms, except the graduation survey, can be found at the BCMB Students MS Teams site (* in Tables below) or are completed online by DocuSign (^ in Tables below). DocuSign forms should be initiated by the student after approval is granted at the committee meeting. Completed/signed paper forms or pdfs should be submitted to the BCMB Coordinator.

M.S. Program

Occasion	Forms Needed (*, on BCMB Students MS Teams site; ^, on the Graduate Studies website)	Copies Needed
Within 30 days of starting	• IDP, Year 1*	• 1
Form Thesis Committee during 1st semester	• BCMB Guidance Committee Form*	• 1
Oral presentation of prospectus	• BCMB Grad Student Rubrics* • Prospectus form^	• Each Committee member plus student • 1
Before Sept 15 of 2nd year	• IDP, Year 2*	• 1
Year 2 Committee meetings	• BCMB Grad Student Rubrics*	• Each Committee member plus student
Approval to Defend	• BCMB Grad Student Rubrics* with required signatures	• Each Committee Member
Thesis Defense	• Plan A Completion form^ • Graduation survey	• 1 • Filled out by the student

Ph.D. Program

Occasion	Forms Needed (*, found on MS Teams; ^, found on ORGS website)	Copies Needed
Within 30 days of starting	• IDP, Year 1*	• 1
Form Thesis Committee during 1st semester	• BCMB Guidance Committee Form*	• 1
Each Advisory Committee Meeting (every 6-12 months)	• BCMB Grad Student Rubrics*	• Each Committee member plus student
Before Sept 15 of 2nd year	• IDP, Year 2*	• 1
Qualifying Exam (End of year 2)	• BCMB Grad Student Rubrics* • Prospectus form^ • Admission to Candidacy (Doctoral) form*	• Each Committee member plus student • 1 • 1
Before Sept 15, each year, years 3+	• IDP, Years 3-5*	• 1
Approval to Defend	• BCMB Grad Student Rubrics* with required signatures	• Each Committee Member
Dissertation Defense	• Dissertation Completion form^ • Graduation survey	• 1 • Filled out by the student

Prospectus Requirements for M.S. Students

Four components are necessary to move towards completion of the Master's Program: (1) demonstration of proficiency in the fields of Biochemistry, Cell Biology and Molecular Biology; (2) approval of a written prospectus by the Advisory Committee; (3) oral presentation of the prospectus, and (4) submission of a written prospectus and signed prospectus form to the Office of Graduate Studies and the BCMB coordinator.

(1) Proficiency in Biochemistry, Cell Biology and Molecular Biology is demonstrated through successful completion of the core courses, SCI710 and SCI720, with a grade of B or higher. This requirement can be deferred if either of the courses were not offered prior to the prospectus stage and are in progress at the time of the prospectus.

(2) The **written prospectus** should be prepared in the format of a "Letter of Intent" for granting agencies, an NIH Specific Aims page (1-3 single-spaced pages), or slightly longer format that is approved by your advisor and committee. It should convey the motivation for the research question, significance, experimental approach, and expected results.

- The prospectus should show that the student is acquainted with the literature relevant to the research problem. It should also demonstrate that the student understands how to apply the scientific method to this problem. In addition, the proposal should explain how and why the experimental design is appropriate to address the research problem.
- The prospectus should be written by the student, with advice from the Research Advisor. The Advisor should suggest edits and improvements to the prospectus, as needed, so that the Advisory Committee is presented with a professional and polished work. At the oral presentation meeting, the Advisor will relay to the Advisory Committee the relative roles of the student and the Advisor in designing the experiments and writing the proposal.
- The written prospectus should be distributed to the Advisory Committee early in the second semester in order to allow sufficient time for the oral presentation to occur by Feb. 1st for GTAs, or the end of the second semester at the latest.

(3) The student will **orally present the prospectus** 2 weeks (at the earliest) after submission of the written prospectus to the Advisory Committee. Presentation of the prospectus should typically be completed within one month of submission of the written prospectus. If a delay is necessary, that delay should not extend beyond the end of the semester in which the written prospectus was submitted, typically the second semester. This meeting should occur before the deadline to submit the prospectus to the Office of Graduate Studies, so that the committee may sign the prospectus form at this presentation.

- For the presentation of the prospectus, the student should present a summary of: the significance and rationale of the project, the design of proposed experiments, preliminary data (if available), anticipated outcomes, and potential obstacles and limitations (~30 minutes). A timeline of expected completion of the Aims of the project should also be presented.
- At the beginning of the oral presentation, students will distribute printed copies of the BCMB Graduate Student Rubric to each member of the Advisory Committee. The student will also keep a copy for their own use.
- At the presentation, the Advisory Committee will ask questions to probe the student's understanding of the project and the student's specific field of research. Questions regarding general topics of Biochemistry, Cell Biology and Molecular Biology that relate to the research project or field are also appropriate.

- During the presentation, the student will be given ample time to consider and answer questions. If a student has difficulty answering a question on their own, the Advisor and Committee members may facilitate the discussion by helping the student walk through an answer. Advisors and Committee members should only answer questions if it is unreasonable to expect the student to know the answer, corrections to the answer are necessary, or the student is unable to answer the question with facilitation.
- After the presentation, the student will leave the room and fill out their BCMB Graduate Student Rubric to self-evaluate. Meanwhile, the Advisory Committee will discuss the student's progress academically, intellectually, and experimentally, including filling out the BCMB Graduate Student Rubric. The Committee will also evaluate the student's potential for achieving the M.S. and the appropriateness of the proposed timeline.
- The Advisory Committee and the student will discuss their evaluations after the closed discussion. The Committee will articulate strengths to be built upon, and any challenges to address.
- The Advisory Committee may sign the "Prospectus" form at this point (see next section for more information).

(4) The student will submit their **written prospectus and the "Prospectus form"** online via DocuSign by Feb. 1st, or the end of the second semester at the latest.

- For students who are requesting appointment or reappointment to a GTA position, the deadline to submit their prospectus is **February 1** (for student's entering the Master's Program in the fall or summer) or by **October 1** for students entering in the spring.
- The prospectus must be on file with the Office of Graduate Studies before students can enroll in more than 3 Thesis Credits.
- Note that the prospectus on file with the Office of Graduate Studies must be no more than two double-spaced pages. If the prospectus is longer than this, the student may submit a summary of or a portion of the prospectus presented to their committee.
- The prospectus form also requires that any IRB/IACUC/IBC approval has already been established.
- In most cases, the Advisory Committee will agree to approve the Prospectus form at the committee meeting where the student presents their prospectus. However, if there are unavoidable delays, the student may request that their Committee members sign the form (via DocuSign) prior to that meeting. Committee members may decide whether or not they are willing to sign prior to the meeting. In any case, the student must provide their polished, Advisor-approved, written prospectus to the Advisory Committee before Committee members sign the form.
- If any Advisory Committee member does not assess the student to be ready, they may elect not to sign the Prospectus form. "Not ready" generally means that the Committee member has identified one or more major weaknesses in the written prospectus or oral presentation of the prospectus such that they are concerned that the student is not well-positioned to complete their Master's degree within the expected timeline. In that case, the Committee will present the student with a plan for improving on identified weakness(es). Then, the student will have 3 months to implement the plan. When the student and the Advisor decide that the student is ready, the student will have a second opportunity to submit a new prospectus and orally present it a second time.

Qualifying exams and Advancement to Candidacy for the Ph.D.

Four components are necessary to qualify a Ph.D. student to advance to candidacy for the Ph.D.: (1) demonstration of proficiency in the fields of Biochemistry, Cell Biology and Molecular Biology; (2) approval of a written thesis proposal by the Advisory Committee; (3) oral defense of the thesis proposal; (4) submission of "Prospectus" and "Admission to Candidacy" forms to the BCMB coordinator.

(1) Proficiency in Biochemistry, Cell Biology and Molecular Biology is demonstrated through completion of the core courses, SCI710 and SCI720, with a grade of B or higher. This requirement can be deferred if either of the courses were not offered prior to the qualifying exam and are in progress at the time of the advancement to candidacy decision.

(2) The **written thesis proposal** should be submitted to the thesis committee *at least 2 weeks prior to the oral defense*. Oral defense of the proposal should be completed *before the beginning of the 5th semester* in the program (e.g. during Spring or Summer of the second year for students entering in Fall).

- The written thesis proposal should be prepared in the format of an application for an NIH F31 fellowship. The specific sections to be included are Specific Aims (1 page), Research Strategy (6 pages), and References. Formatting should be according to NIH guidelines. If a student identifies another fellowship opportunity for which they *intend to submit* an application, the Advisory Committee may approve submission of the thesis proposal in the format of this fellowship opportunity. However, the length of the proposal must not be less than the NIH F31. For example, the 2-page proposal for the NSF GFRP fellowship is too short to serve for the qualifying exam.
- Students are strongly encouraged to submit their final proposal to the NIH (or another granting agency or foundation) to apply for a fellowship.
- The research proposal should show that the student is acquainted with the literature relevant to the research problem. It should also demonstrate that the student understands how to apply the scientific method to this problem. In addition, the proposal should explain how and why the experimental design is appropriate to address the research problem.
- The proposal should be written by the student, with advice from the Research Advisor. The most common timeline for proposal writing is to begin writing in the spring semester and then use the Biomedical Grant Writing class (will be SCI 761; currently offered as SCI 791) to help polish the proposal, The Advisor should suggest edits and improvements to the proposal, as needed, so that the Advisory Committee is presented with a professional and polished work. At the oral defense meeting, the Advisor will relay to the Advisory Committee the relative roles of the student and the Advisor in designing the experiments and writing the proposal.

(3) For the **oral defense of the thesis proposal**, the student should present a summary of: the significance and rationale of the project, the design of proposed experiments, preliminary data, anticipated outcomes, and potential obstacles and limitations (~30-45 minutes). A timeline of expected completion of the Aims of the project should also be presented. Two hours should be allowed for the defense to allow sufficient time for discussion of the proposal.

- At the beginning of the oral defense, students will distribute copies of the BCMB Graduate Student Rubric to each member of the Advisory Committee.

- At the oral defense, the Advisory Committee will ask questions to probe the student's understanding of the project and the student's specific field of research. Questions regarding general topics of Biochemistry, Cell Biology and Molecular Biology that relate to the research project or field are also appropriate. Committee members should ask questions to probe as many areas of the BCMB Graduate Committee Rubric as possible. The goal is to find the limits of the student's knowledge, so students should expect to be unable to answer some questions.
- During the oral defense, the student will be given ample time to consider and answer questions. If a student has difficulty answering a question on their own, the Advisor and Advisory Committee members may facilitate the discussion by helping the student work through an answer. Advisors and Committee members should only answer questions if it is unreasonable to expect the student to know the answer, corrections to the answer are necessary, or the student is unable to answer the question with facilitation.
- After the presentation, the student will leave the room, and the Committee will discuss the student's progress academically, intellectually, and experimentally. The BCMB Graduate Student Rubric will be used by the thesis committee to evaluate whether the student has acquired the skills and competencies that are appropriate for advancement to candidacy. The committee will also evaluate the student's potential for achieving the Ph.D. and the appropriateness of the proposed timeline. Advisory Committee members will vote anonymously whether to advance the student to candidacy for the Ph.D.
- If the Advisory Committee unanimously recommends advancement to candidacy, they will sign the forms as specified in section (4). If the Advisory Committee recommends changes to the written thesis proposal, changes must be made and approved by the thesis advisor prior to advancement to candidacy.
- If the Advisory Committee does not unanimously vote for the student's advancement to candidacy, the Committee will present the student with a plan for improving on identified weaknesses. Then, the student will have 6 months to implement the plan. When the student and the Advisor decide that the student is ready, the student will have a second opportunity to Advance to Candidacy by defending their proposal a second time.

(4) After successful completion of their qualifying exam as outlined in 1-3 above and approval of all Committee members, the student will submit 1) their **written prospectus and the "Prospectus form"** online via DocuSign, and 2) the **signed Admission to Candidacy (Doctoral) form**** to the **BCMB coordinator**.

- The Prospectus form is signed online via DocuSign by all Committee members
- Note that the Prospectus on file with the Office of Graduate Studies must be no more than two double- spaced pages. Therefore, the abstract, summary, specific aims page, or other similar component of the written proposal can be used as the prospectus for the Office of Graduate Studies.
- The Prospectus form also requires that any IRB/IACUC/IBC approval has already been established.
- The Prospectus must be on file with the Office of Graduate Studies before students can enroll in more than 6 Dissertation Credits. If the student and the Advisor wish to submit a prospectus and prospectus form prior to the qualifying exam, they may do so, with the permission of

Committee members. The student would then need to write a written prospectus according to the specifications outlined for M.S. students.

- **The Admission to Candidacy (Doctoral) form should be signed by the Advisor and approved by the Chair of the BCMB Committee (not a Department Chair, and not the Advisory Committee).

Expectations for Graduation

BCMB **M.S. students** must meet the following five expectations to graduate:

1. **Proficiency in Biochemistry, Cell Biology and Molecular Biology** is demonstrated through successful completion of the core courses, SCI710 and SCI720, with a grade of B or higher.

2. **Approval to Defend** – M.S. students must be granted unanimous approval to defend by the Advisory Committee, including meeting the required levels on the BCMB Graduate Student Rubric (see Rubric section of handbook) at a committee meeting 3-6 months before the planned defense date. The signed, completed Rubrics from all Advisory Committee members must be given to the BCMB coordinator.

3. **Thesis** – M.S. students must prepare a written thesis under the guidance of their Advisor and in accordance with the guidelines of the Office of Graduate Studies and the conventions of their field of research. Students should consult the Thesis/Dissertation Guidelines posted on the Office of Graduate Studies website for details about the required formatting of the document.

The thesis must include a comprehensive Introduction and Discussion (typically 5-10 pages, each), and the student must carry out most of the writing. The thesis should include one or more 'data' chapters, describing the author's results, approach and interpretation and including the author's data figures. There is also typically a Materials and Methods chapter or an equivalent section within each 'data' chapter.

CMU allows either a traditional format or a journal article format. The traditional format follows all of the guidelines above. The journal article format allows substitution of research articles for data chapters. To use the journal article format, a primary research article must be accepted, submitted or nearly ready to submit to a peer-reviewed journal. The choice of traditional or journal format should be agreed upon by the Advisory Committee at the meeting at which approval to defend is granted.

Students are strongly encouraged to include all significant research findings in their thesis, since the thesis serves is documentation of that work, even when it is not otherwise published. This includes negative results and work done to validate methods and reagents, especially when the work/results informed the planning, decision-making, analysis or interpretation in the student's research project.

The thesis is expected to be a professional and polished work. The written thesis must be approved by the Advisor and then submitted to the Advisory Committee at least 2 weeks prior to the defense.

Before submission of the dissertation, the Advisor must perform an iThenticate analysis on the dissertation, and the resulting report should be attached to the completion form in DocuSign. Students are encouraged to discuss the iThenticate report with their Advisor.

4. **Thesis Defense** – M.S. students must complete a defense consisting of a public oral presentation of their thesis research, followed by a closed oral examination session with their Advisory Committee. The Committee must deem both parts of the candidate's defense satisfactory. The defense should be planned with the Committee approximately 2 months in advance. The general format and procedures for the oral thesis defense are detailed below:

- Students will work with their Advisor and Advisory Committee to find a day/time that works

well for everyone. Allow 1 hour for the seminar (public) and 2 hours for the defense (closed).

- After the Committee has approved of the date & time, the student will email the BCMB coordinator with the information below. The Advisor must be cc'd on the email. This email should be sent at least two weeks ahead of the defense.
    - Seminar title
    - Date for seminar and defense
    - Requested room(s) for seminar and defense
    - Time for seminar
    - Time for defense
    - Picture to use for the seminar posters (can be photo of student or of research)
- For the public portion of the oral defense (thesis seminar), the student should present a summary of: project significance and rationale, project design/approach, results/discussion, and future directions (~30-45 minutes). After the presentation, the audience will have an opportunity to ask questions of the candidate.
- In the closed oral examination, the Advisory Committee will ask questions to probe the student's understanding of their project and the student's specific field of research. Questions regarding general topics of Biochemistry, Cell Biology and Molecular Biology that relate to the research project or field are also appropriate.
- During the oral defense, the student will be given ample time to consider and answer questions. If a student has difficulty answering a question on their own, the advisor and advisory committee members may facilitate the discussion by guiding the student toward an answer but not giving it to them. Advisors and Committee members should only answer questions if it is unreasonable to expect the student to know the answer, corrections to the answer are necessary, or the student is unable to answer the question with facilitation.
- After the presentation, the student will leave the room, and the committee will discuss the student's progress academically, intellectually, and experimentally. The committee will also discuss whether the student has satisfactorily completed the other requirements for graduation. Committee members will vote anonymously whether the defense is approved.
- If the Committee approves of the thesis and defense, all Committee members will sign the thesis "Plan A Completion Approval" form. However, in most cases the Committee will recommend changes to the written thesis. In this case, the candidate must make the changes to the satisfaction of the Committee prior to the form being signed.
- If the Advisory Committee does not unanimously vote to approve the thesis, the Committee will present the student with a plan for addressing the weaknesses. Then, the student will have 3 months to implement the plan. When the student and the Advisor decide that the student is ready, the student will have a second opportunity to complete the degree by defending their thesis a second time.

5. **Presentation** – M.S. students must do at least 1 poster or oral presentation at a regional or national scientific meeting.

6. Upon completion of graduation requirements, BMCB students are requested to fill out the graduation survey to help the BCMB program continue to improve.

BCMB **Ph.D.** candidates must meet the following six expectations to graduate:

1. **Proficiency in Biochemistry, Cell Biology and Molecular Biology** is demonstrated through successful completion of the core courses, SCI710 and SCI720, with a grade of B or higher.

2. **Approval to Defend** – Ph.D. students must be granted approval to defend by the Advisory Committee, including meeting the required levels on the BCMB Graduate Student Rubric (see Rubric section of handbook) at a committee meeting 3-6 months before the planned defense date. The signed, completed Rubrics from all Advisory Committee members must be given to the BCMB coordinator.

3. **Dissertation** – Ph.D. candidates must prepare a written dissertation under the guidance of their Advisor and in accordance with the guidelines of the Office of Graduate Studies and the conventions of their field of research. Students should consult the Thesis/Dissertation Guidelines posted on the Office of Graduate Studies website for details about the required formatting of the document.

The dissertation must include a separate, *comprehensive* Introduction chapter and a separate, *comprehensive* Discussion chapter. The Introduction and Discussion chapters must be written in sufficient depth to demonstrate that the student has thought deeply about their project and how it fits into the larger field. Typically, about 20 pages or more are needed to fully develop each of these sections. Students are encouraged to include figures to illustrate key concepts in the Introduction and summary diagrams in the Discussion. A dissertation should include multiple 'data' chapters, describing the author's results, approach and interpretation and including the author's data figures. There is also typically a Materials and Methods chapter or an equivalent section within each 'data' chapter.

CMU allows either a 'traditional format' or a 'journal article format' for dissertations. The traditional format should follow all of the guidelines above. The journal format allows replacement of data chapters with research articles. To be eligible for the journal article format, the student must have two or more primary research articles that have been published, submitted, or nearly ready for submission to a peer-reviewed journal. In addition, for both articles, the student must have written the first draft and in general had a significant role in writing the manuscript. If these requirements are met, each article can replace one 'data' chapter of the dissertation. For the journal format, there must be at least 2 data chapters. The choice of traditional or journal format should be agreed upon by the Advisory Committee at the meeting at which approval to defend is granted.

Students are strongly encouraged to include all significant research findings in their dissertation, since the dissertation serves is documentation of that work, even when it is not otherwise published. This includes negative results and work done to validate methods and reagents, especially when the work/results informed the planning, decision-making, analysis or interpretation in the student's research project.

The dissertation should be a professional and polished work. The written dissertation must be approved by the Advisor and then submitted to the Advisory Committee at least 2 weeks prior to the defense.

Before submission of the dissertation, the Advisor must perform an iThenticate analysis on the dissertation, and the resulting report should be attached to the completion form in DocuSign. Students are encouraged to discuss the iThenticate report with their Advisor.

4. **Dissertation Defense** – Ph.D. candidates must complete a defense consisting of a public oral presentation of their dissertation research, followed by a closed oral examination

session with their Advisory Committee. The Committee, which will include an outside member for the dissertation defense, must deem both parts of the candidate's defense satisfactory. The defense should be planned with the committee approximately 2 months in advance. The general format and procedures for the oral dissertation defense are detailed below:

- The student must receive approval by their Advisory Committee 3-6 months in advance to schedule the dissertation defense. Refer to the BCMB Graduate Student Rubrics section for requirements to schedule the defense.
- The student must also recruit an outside Advisory Committee member as per the instructions in the Committees section of the handbook.
- Students will work with their Advisor and Advisory Committee to find a day/time that works well for everyone. Allow 1 hour for the seminar (public) and 2 hours for the defense (closed).
- After the Committee has approved of the date & time, the student will email the BCMB coordinator with the information below. The Advisor must be cc'd on the email, and the email must be sent at least 2 weeks ahead of the defense date.
    - Seminar title
    - Date for seminar and defense
    - Requested room(s) for seminar and defense
    - Time for seminar
    - Time for defense
    - Picture to use for the seminar posters (can be photo of student or of research)
- At the beginning of the oral defense, students will distribute printed copies of the BCMB Graduate Student Rubric to each member of the Advisory Committee. For the public portion of the oral defense, the student should present a summary of: project significance and rationale, project design/approach, results/discussion, and future directions (~45 minutes). After the presentation, the audience will have an opportunity to ask questions of the candidate.

- In the closed oral examination, the Advisory Committee will ask questions to probe the student's understanding of their project and the student's specific field of research. Questions regarding general topics of Biochemistry, Cell Biology and Molecular Biology that relate to the research project or field are also appropriate.

- During the oral defense, the student will be given ample time to consider and answer questions. If a student has difficulty answering a question on their own, the Advisor and Advisory Committee members may facilitate the discussion by guiding the student toward an answer but not giving it to them. Advisors and Committee members should only answer questions if it is unreasonable to expect the student to know the answer, corrections to the answer are necessary, or the student is unable to answer the question with facilitation.

- After the presentation, the student will leave the room, and the Committee will discuss the student's progress academically, intellectually, and experimentally. The Committee will also discuss whether the student has satisfactorily completed the other requirements for graduation. Committee members will vote anonymously whether the defense is approved.

- If the committee approves of the dissertation and defense, all committee members will sign the "Dissertation Completion Approval" form (found at Forms for BCMB Students). However,

in most cases the committee will recommend changes to the written dissertation. In this case, the candidate must make the changes to the satisfaction of all members of the committee prior to the form being signed.

If the Advisory Committee does not unanimously vote to approve the dissertation, the Committee will present the student with a plan for addressing the weaknesses. Then, the student will have 6 months to implement the plan. When the student and the advisor decide that the student is ready, the student will have a second opportunity to complete the degree by defending their dissertation a second time.

5. **Publication** – At the time of the dissertation defense, Ph.D. candidates must have at least 1 first-author or co-first author research manuscript that is either published or submitted to a peer-reviewed journal and received positive feedback from the reviewers. In rare exceptions, other substantial work may be accepted *in lieu* of a research paper at the discretion of the Advisory Committee.

6. **Presentation** – Ph.D. candidates must do at least 1 poster or oral presentation at a regional or national scientific meeting.

7. Upon completion of graduation requirements, BMCB students are requested to fill out the graduation survey to help the BCMB program continue to improve.

BCMB Graduate Student Rubrics

During their time in the BCMB program, graduate students are expected to develop a number of skills and competencies, as well as to complete significant research. To help students and advisors visualize the progress that students are making toward their goals, students, advisors, and other committee members will complete rubrics. These rubrics will be used in all of the situations described below.

1. **Committee Meetings** -- At each committee meeting, each Committee member will complete a BCMB Graduate Student Rubric. For some of the categories, it may be necessary for committee members to ask the Advisor for feedback. Alternatively, committee members can leave blank any sections that were not covered during the committee meeting. Any major discrepancies between Committee members will be discussed at the meeting. Students will also complete a rubric to self-evaluate. At the end of the committee meeting the Committee and the student will discuss the rubrics. It is expected that students will progress through the levels as they gain experience. Completed rubrics should be given to the graduate program administrator.

To assist the Committee in evaluating the student's writing and to provide opportunities for students to receive regular practice and feedback on their writing, at each regular Committee meeting, student will submit a writing sample to their Committee at least 1 week in advance of the meeting. The writing sample should comprise a 1-2 page summary of the student's research progress. (This is not required at meetings that already require submission of written work, such as the prospectus, dissertation proposal, or thesis/dissertation). See the Advisory Committee Guidelines below for more detail.

2. **Ph.D. Qualifying Exam** – Students who enter the BCMB Ph.D. program must pass a qualifying exam before advancing to Ph.D. candidacy. This exam involves a written and oral defense of the proposed Ph.D. project (see Qualifying Exam section of the BCMB handbook for more information). Students must achieve the levels indicated in the table below to pass the qualifying exam.

3. **Approval to Defend** -- The Advisory Committee will approve the student for defense of their thesis or dissertation at a committee meeting that occurs 3-6 months before the planned defense. Students must achieve the levels indicated in the table below to be granted approval to defend.

Levels Required on BCMB Graduate Student Rubric		
	Pass Ph.D. Qualifying Exam or Approval to Defend M.S.	***Approval to Defend Ph.D.***
Research Project	Level 3 or above	Level 4 or above
Ethics and RCR	Answer Yes to both questions	Answer Yes to both questions
Other categories	At least 2 at level 3 or above All others at level 2	At least 2 at level 5 All others at level 4

Student's Name_____ Date of Committee Meeting _____

Committee Member _____Committee Chair _____

Category	Level 1	Level 2	Level 3	Level 4	Level 5
Research Project	At beginning of research project, little accomplished.	Has completed a meaningful portion of research, equivalent to one or more publishable figures	Has completed a substantial body of publishable research, but slightly less than one first-author paper.	Has completed a large body of work, equivalent to one first- author paper in a reputable, peer-reviewed journal.	Has completed a large body of work, equivalent to one first-author paper in a reputable, peer-reviewed journal, plus additional significant work.
Comments:					
Experi-mental design	All experiments are designed by a mentor. Needs help understanding why experiments are done.	Most experiments are designed by a mentor, but has some ideas about approach. Grasps the purpose of experiments and appropriate controls with increasing frequency.	Needs help with big directions, but can then design appropriate experiments, including controls, replicates. Can reference sources for experimental design.	Can usually design appropriate experiments including controls, replicates; may need some help with some aspects of experimental design. Uses current papers to inform experimental design with increasing frequency.	Can design appropriate experiments given any new situation relevant to their work. Includes appropriate controls. Can identify broad new directions the research should take. Uses current papers as appropriate to inform experimental design.
Comments:					
Data Analysis	Needs help understanding how to consolidate, represent, and interpret data.	Can carry out and interpret simple data analyses when prompted. Considers controls.	Can independently create figures from data, with appropriate labels and legends. Shows solid ability to interpret results. May need help with formatting, statistics.	Usually independently creates figures from data, in appropriate format, with appropriate labels/legends. Makes appropriate comparisons using statistics. Shows solid ability to interpret results, sometimes using current papers to inform data analyses.	Always independently creates figures from data, in appropriate format, with appropriate labels and legends. Makes appropriate comparisons using statistics. Shows solid ability to interpret results, always using current papers to inform data analyses as appropriate. Demonstrates deep understanding of data.
Comments:					
Back-ground knowledge (SCI, other courses)	Limited general background knowledge.	Reasonable understanding of knowledge related to project.	Solid understanding of most knowledge highly relevant to project. Limited understanding on less-related topics.	Deep understanding of all knowledge highly relevant to project, and adequate knowledge of less-related knowledge.	Deep understanding of all general background knowledge.
Comments:					

Category	Level 1	Level 2	Level 3	Level 4	Level 5
Knowledge of the literature	Limited understanding of the primary literature. May have difficulty reading papers or difficulty retaining information from papers.	Can correctly explain some of the papers that were given to the student by a mentor, acknowledges important discoveries with appropriate citations.	Can correctly explain most of the important papers given to the student by a mentor, cites papers appropriately, may find some new, relevant papers on their own.	Can correctly explain and critically evaluate a substantial body of papers, able to recall names of scientists and their important discoveries, often finds new relevant papers on their own.	Deep understanding of the key papers in the field, strong critical evaluation of papers, able to recall names of scientists and their important discoveries, consistently finds new relevant papers on their own, may know their specific area better than their Advisor.
Comments:					
Written Communi-cation/ Writing sample	Difficulty communicating clearly.	Adequate written communication.	Adequate to strong written communication.	Strong written communication.	Clear and concise written communication, may span writing for experts and more general readers.
Comments:					
Oral Communi-cation	Difficulty communicating clearly	Adequate oral Communication.	Adequate to strong oral Communication.	Strong oral communication.	Clear and concise oral communication; may span experts and non-experts.
Comments:					

Research Ethics and RCR

- Has student successfully completed SCI 740? Circle one: Yes | No
- Does student demonstrate awareness of and adherence to best practices in research ethics and RCR? Circle one: Yes | No

Anticipated Date of Defense, if known (month/year) _____Is student on track to defend on time? Circle one: Yes | In Doubt | No

If approval to defend Ph.D. dissertation is being granted within the next 3-6 months:

- Each Committee Member should initial here to indicate approval to defend. Note that Res. Proj. must be level 4 or 5; at least two other categories level 5; all others level 4 or 5_____.
- Describe experiments that must be completed prior to setting defense date, or state none needed:

- The Advisor should initial to indicate that the student has given at least one poster or oral presentation at a regional or national scientific meeting (M.S. and Ph.D. student), AND that they have at least one first-author paper accepted (or with positive feedback from reviewers) (Ph.D. students only). _____

Advisory Committee Guidelines

1. **Selection of an Advisor** -- Research Advisors are selected as part of the application process. Advisors must be BCMB faculty with full graduate faculty status. In certain special circumstances the student may request to change Advisors. Requests must be made to the BCMB Committee.

2. **Role of Advisory Committee-** The role of the Advisory Committee (sometimes called the thesis or dissertation committee) is to advise the student with respect to coursework, scientific content, experimental approach, and other aspects of the student's graduate program. The Advisory Committee will also administer exams and defenses. Advisory Committee members provide an additional perspective to supplement and complement the major research Advisor's expertise and approach.

3. **Selection of Advisory Committee**- Students must select an Advisory Committee in consultation with their Advisor during the first semester of course work. The Committee will consist of the student's Advisor and at least two additional members of the graduate faculty. Committee members should all have enough expertise in at least one area of the student's proposed project to be able to provide sound scientific advice. At least one of the other Committee members should be BCMB faculty; however, a graduate faculty member from a cognate area or from outside of CMU may serve as the third Committee member. The graduate student must complete an Advisory Committee Selection form (found at BCMB MS Teams Site).

4. **Changes to Advisory Committee** – Changes may be made to the Advisory Committee at the discretion of the student, in consultation with the Advisor. A new Committee selection form must be completed.

5. **Committee Meetings** – During their first semester, all BCMB students will select their committee as described above. Thereafter, M.S. students and Ph.D. students in their first two years will meet with their Committee during their second and third semesters. Typically, MS students will defend their thesis and Ph.D. students will undergo the oral defense of their proposal before their 5th semester. Ph.D. students in years 3 and beyond will meet with their Committee annually.

- At the first meeting, the Advisory Committee will review and approve the student's course requirements in addition to hearing the student's research presentation.
- One week prior to each regular committee meeting (where the committee is not reviewing the prospectus, dissertation proposal, thesis or dissertation), the student will share a 1-2 page summary of their research progress. The summary will include a minimum of one paragraph describing the rationale for the experiments, one paragraph describing the methods and controls, one paragraph describing the results, and one paragraph describing the interpretation of the results and future experiments. The student will write the summary independently, without feedback from the PI. The Committee should provide feedback on the writing.
- At each Committee meeting, the student will leave the room, and each Committee member will complete a BCMB Graduate Student Rubric (found at BCMB MS Teams Site). Students will also complete a rubric to self-evaluate. See the rubric section of the BCMB

handbook for more information. After discussion amongst the Committee members, the student will return to the room, and the Committee will discuss the Rubric with the student.

- After discussion of the rubric, the Advisor will leave the meeting to provide the student time for additional discussion with Committee members.

6. **Ph.D. Qualifying Exams** – The Ph.D. qualifying exam will be administered by the Advisory Committee. See the qualifying exam section of the BCMB handbook for more information.

7. **Approval to Defend** -- The Advisory Committee will approve the student for defense of their thesis or dissertation at a committee meeting that occurs 3-6 months before the planned defense. Approval is based on the BCMB student rubric (see rubric section in the BCMB handbook for more information). If the Committee does not approve the student at that time, the defense must be delayed. Exceptions due to rare, special circumstances must be approved by the BCMB program committee. If, based on their rubric evaluations, the Advisory Committee does not unanimously approve the student for defense, the Committee will present the student with a plan for addressing the weaknesses. The Committee will then reconsider approval for defense at the next committee meeting.

8. **Thesis or Dissertation Defense** -- The Advisory Committee will administer the thesis or dissertation defense.

9. **External committee members** -- For **Ph.D. dissertation defenses**, an additional Committee member will be added after the Committee has given approval to write and defend the dissertation. This Committee member will be from outside CMU. Steps to selecting an external committee member:

1. Students work with their Advisors to identify a suitable outside Committee member. The Committee member must meet the guidelines listed below. Multiple potential candidates can be identified at this point, if needed, to ensure that at least one will be available to participate and approved by the BCMB committee.
2. Students will contact the potential committee member(s) to ask if they are willing and able to serve, and if so to obtain their CV(s).
3. Students submit their choice(s) to the chair of the BCMB committee, together with the potential new Committee member's CV. It can be helpful to indicate which potential Committee member is preferred (if more than one is provided).
4. The BCMB committee decides whether to approve the outside Committee member, based on the guidelines below.
5. The external Committee member must be approved through the Office of Graduate Studies thought completion of a DocuSign form requesting associate graduate faculty status. This approval must be completed prior to the dissertation defense. (On page 2 of the form, ask the external faculty member to fill in BCMB, for 'the Department of ___'. After ORGS approval, the form will be routed to the Chair of the BCMB committee.) The chair of BCMB will notify the student and Advisor when approval is received.
6. The student formally invites that person and includes them in deciding the date/time of the dissertation defense.

Guidelines for External Committee Members:

1. Hold a PhD (or equivalent) in their field
2. Currently or recently have led a research group that includes graduate students and/or PhD-level scientists
3. Evidence of research activity (e.g., recent publications)

External Committee members can attend the dissertation defense either in person or virtually. To cover the costs of an in-person visit, the external Committee member may present a seminar in a department with such a seminar series, and/or there may be funds available through the BCMB program to offset travel costs. Students should discuss these possibilities with their Advisor.

Role of the Advisor in Advisory Committee Meetings

All committee meetings should be centered on the student. Committee members typically spend most of the meeting listening to the student's presentation, asking the student questions, and engaging in some follow-up discussion with the student. The Advisor should engage in these activities along with the other Committee members, but refrain in answering questions for the student. Specifics about different types of Committee meeting are detailed below.

1. Regular Advisory Committee meetings.

The goal of a standard Committee meeting is to keep the student on track and to make sure they are progressing as expected in all of the areas represented on the BCMB rubric, providing support as needed. The Advisor should try to let the student do as much of the speaking as possible. If the student seems to be going off track, the Advisor can ask the student leading questions to get them back on track. The Advisor should only answer questions when this approach is not working, and/or when it is a question that the student cannot be expected to know.

There may be some instances in which the Advisor speaks more directly to the other Committee members. For example, maybe a Committee member suggests a new approach to a particular problem and the Advisor is unfamiliar with this method. The Advisor might then ask follow-up questions about how that would work. However, this discussion should not distract too much from the student and can be returned to in more detail after the Committee meeting. Other times, particularly early on when the student's background knowledge is limited, the Advisor might fill in a few details after the student has exhausted their explanation of a subject.

2. Ph.D. qualifying exams.

During Ph.D. qualifying exams, it is even more important that the student does all of the speaking. The goal of a qualifying exam is for the committee to deeply probe the student's knowledge, critical thinking, etc. (the areas of the BCMB student rubric), and keep pushing until they find the edges of those skills/knowledge. Then, the committee assesses whether that state is sufficient to advance to Ph.D. candidacy, or whether there are areas that need to be addressed before the student is ready. The Committee needs to hear from the student directly to make this assessment.

Because the exam is intended to push the student to the limits of their knowledge, there will certainly be questions they can't answer. At this point, it may sometimes make sense for the Advisor to chime in to keep the overall discussion from going awry. Therefore, the Committee will view an answer or substantial help from an Advisor as the edge of the student's knowledge. If the Advisor answers/helps prematurely, the rest of the Committee will think that the student's knowledge is less than it is, and the student is at risk of not passing their exam. And if the Advisor chimes in so much that it's impossible for other Committee members to judge the student, then that exam would be null on technical grounds. The exam would need to be repeated in such a way that the Committee can accurately assess the student. The other Committee members would need to work with the Advisor to prevent this situation from happening again.

3. Approval to defend/thesis defense.

To be granted approval to defend, the student should be able to discuss the ins and outs of their data, rationale, analysis, pertinent literature, and other aspects covered in the BCMB

student rubric. M.S. students should be able to discuss these areas reasonably well, whereas Ph.D. students should possess a deep understanding, usually deeper (but more narrow) than that of the Advisor. The Committee needs to see these qualities in order to judge whether the student as ready to defend. Therefore, the Committee meeting where the student is asking to defend, and the defense itself, are two more occasions where it is particularly important that the student is the one answering the questions.

Individual Development Plan (IDP)

1. **IDP Description and Benefits** – Students in the BCMB M.S. and Ph.D. programs will create and maintain an Individual Development Plan (IDP) throughout the course of their studies. The NIH, a funding body which strongly encourages the use of IDPs, describes IDPs as follows:

   > *At its best, research training is an intentional and purposeful activity that is the product of a thoughtful analysis of the background, interests and needs of each student and postdoctoral trainee. This includes developing a mentoring plan that assesses the needs and goals of each student and postdoc, describes short- and long-term career objectives, and identifies professional development activities needed to reach them. The individual development plan (IDP) is a tool to help in this planning process and also to facilitate communication between mentees and mentors. An IDP should be viewed as a dynamic document that is periodically reviewed and updated throughout an individual's training. IDPs are of proven value at any stage, from the undergraduate to the postdoctoral level.*

   The CMU BCMB program uses an IDP adapted from Stanford University's Biosciences program, which lists the following benefits to IDPs:

   - *Clarify short-, medium-, and long-term professional goals*
   - *Identify developmental areas and helpful resources*
   - *Garner timely support from your advisor*
   - *Create an action plan for your academic, scientific, and professional development*
   - *Strengthen your relationship and set clear expectations with your advisor*
   - *Smooth or shorten your path to completing your degree and/or publishing a high-impact paper*

2. **IDP Process** – On an annual basis, students will complete the appropriate IDP form (fournd on the BCMB Students MS Teams site), meet to discuss it with their advisor, and verify the completion of the IDP meeting. Although students and advisors are jointly responsible for completing the IDP, students are responsible for scheduling meetings and completing IDP forms. Advisors are responsible for verifying that the meetings took place. Below are the key deadlines for accomplishing these tasks:

   Key Deadlines for Completing the Annual IDP Process

Action	First Year Students	All Other Students
Schedule a planning and mentoring meeting with your advisor		
Before your meeting, download and complete the appropriate IDP form (see below for description of forms). Ideally, share the completed form with your advisor in advance.		
Hold your annual IDP meeting with advisor	Within 30 days of joining your lab	By Sept 1
Your advisor must email and notify the Graduate Program Administrator that you met to discuss your IDP	Within 30 days of joining your lab	By Sept 1

3. **IDP Forms** – There are three IDP forms for students in different years of the programs. M.S. students will only complete the IDP forms for years 1 and 2, while Ph.D. students will complete IDP forms each year. Each form and the major topics it covers are shown in the table below. The appropriate form should be downloaded by the student and filled out prior to their annual IDP meeting with their advisor. Ideally, the completed form should be shared with the advisor in advance of the meeting.

Key Sections	IDP Year 1	IDP Year 2	IDP Years 3-5	Notes
Student/ Advisor Responsibilities	X			Mix of open-ended questions and checklists to help students reflect on their progress and goals
Research Progress		X	X	
Development Activities		X	X	
Academic/ Professional Skills	X	X	X	
Training and Mentoring	X	X	X	
Action Plan	X	X	X	To be filled out together by student and advisor. Includes takeaways and next steps for the student.

4. **IDP Meeting** – Although not required, it is ideal if the completed form is shared with the advisor in advance of the scheduled meeting. This will allow the faculty advisor to review and prepare comments and questions before the meeting. During the meeting, students are encouraged to lead the discussion of their self-assessment, goals, and plans using the completed IDP form as a guide. This way, students are empowered to take ownership of their training and professional development. The advisor will add his or her perspective, and the two parties will work collaboratively to identify specific actions and resources to help the student achieve their academic/professional goals.

5. **IDP Meeting Verification** – After finishing your meeting with your advisor, ensure that your advisor notifies the Graduate Program Administrator in the Department of Biology office of the meeting's date. It is important to note that this verification only records the date the meeting occurred. The IDP forms and discussions with your advisor remain private between you and your advisor.

For additional information and resources about IDPs, it may be useful to visit the following IDP websites:

- Stanford University Biosciences IDP
- AAAS myIDP

Responsibilities of graduate students

As a graduate student in the BCMB program, you are making a commitment to devote the time and energy needed to engage in research and write a thesis or dissertation. Your research advisor has a right to expect substantial effort, initiative, respect and receptiveness to suggestions and criticisms.

As a graduate student, you must accept the rules, procedures and standards in place in the program and at Central Michigan University. You are expected to:

Academics and Course Registration

- Complete required courses maintaining a cumulative grade point average of a B (3.0) or better and obtain a B or better in both SCI 710 and SCI 720.
- Maintain the required number of credits if you are supported by a Teaching or Research Assistantship: at least 6 credits per semester for fall and spring, and at least 1-2 credits in the summer.
- Maintain registration throughout the program and (for international students) work with the Office of Global Engagement to ensure that visas and (where applicable) employment authorization documents are kept up to date.

Research

- Make a commitment and show dedicated efforts to gain the background knowledge and skills needed to pursue your research project successfully.
- In conjunction with your research Advisor, develop a plan and timetable for completion of all stages of your thesis project, adhere to a schedule and meet appropriate deadlines.
- Engage in full-time research over the summer based on the schedule set with the faculty Advisor.
- Attend relevant seminars.
- Meet with your research Advisor when requested and report fully and regularly on progress and results.
- Maintain a detailed lab notebook with all methods, results, and other relevant information. The lab notebook must be left in the lab after graduation.
- Give serious consideration to the advice and criticism received from your research Advisor and other members of your Advisory Committee.
- Keep your workspace tidy, safe and healthy.
- Show tolerance and respect for the rights of others.
- Be thoughtful and reasonably frugal in using resources provided by your research advisor and the University, and assist in obtaining additional resources for your research or for other group members where applicable.

Program and University Requirements

- Submit prospectus of thesis/dissertation research according to deadlines outlined above. (M.S. students typically submit their prospectus in Year 1; Ph.D. students typically submit their prospectus Year 2, but may submit their prospectus in Year 1)

- Submit other forms as listed in the Forms section of the handbook.
- If you are a M.S. student and a graduate teaching assistant, you must apply for reappointment each year (February 1).
- Individual Development Plan (IDP): on an annual basis, students will complete the appropriate IDP form, meet to discuss it with their advisor, and ensure that their advisor verifies the completion of the IDP meeting. Although students and advisors are jointly responsible for completing the IDP, students are responsible for scheduling/verifying meetings and completing IDP forms. See the IDP section of the handbook for details.
- Check Degree Progress to make sure that courses are being appropriately categorized and counting toward your degree. Ask your Advisor to make any changes required.
- Conform to University, Faculty and graduate program requirements, including those related to research ethics, deadlines, dissertation or thesis style, and conflict of interest.
- Follow the university's policy regarding ownership of intellectual property.

Inclusiveness and Non-Harassment Policies

- Conform to OCRIE's policies prohibiting acts of discrimination or harassment based on age, color, disability, ethnicity, gender, gender expression, gender identity, genetic information, height, marital status, national origin, political persuasion, pregnancy, childbirth or related medical conditions, race, religion, sex, sex-based stereotypes, sexual orientation, transgender status, veteran status, or weight.
- Conform to OCRIE's policies prohibiting sexual misconduct. Note that some CMU faculty, including department chairs, are "designated employees" which means that they are required to report any sexual misconduct that they learn about. See this link for confidential and non-confidential resources for victims of sexual misconduct.

As You Reach the End of Your Program

- When your degree program requirements have been met, terminate your work, clean up your workspace, and inventory your reagents and samples that are still useful for the lab.
- Return borrowed materials to your research Advisor, graduate program, library or reading room, etc. when your project is finished or when return is requested.
- Your lab notebook remains in the lab when you leave.

The following suggestions can make your life a lot easier:

- Review the literature regularly and keep your literature survey up-to-date.
- Maintain exemplary records of your experimental/theoretical work (so that others can replicate your results).
- While your research advisor is required to be reasonably available for consultation, it is your responsibility to keep in touch with your research advisor.
- Make yourself available to your research advisor for regular meetings at mutually acceptable times.

Lab Safety Training and Other Project-Specific Approvals

Before working in the lab you must consult your research advisor for a list of trainings you need to complete. Find and complete the trainings and associated forms at the Office of Laboratory and Field Safety (OLFS) website.

You will need to have approved IACUC (for animal work), IRB (for human studies), and/or IBC (for studies with Biosafety concerns) protocols approved prior to submitting your prospectus, if your work requires these approvals. Discuss the specific training and approval requirements with your Advisor well in advance of submitting your prospectus to ensure that the appropriate approvals are in place. You can find more information about the approval requirements at the Office of Graduate Studies and Research website and related training requirements at the Office of Laboratory and Field Safety website.

Responsibilities of Faculty Advisors

Faculty Advisors are expected to facilitate and optimize student progress towards attainment of the graduate degree. Advisors should promote a partnership with graduate students that exemplifies the best aspects of scientific cooperation, intellectual growth and scholarly rigor.

The requisites for qualifying as a BCMB faculty including meeting standards for graduate faculty as defined by ORGS, an active research program in biochemistry, cell biology and molecular biology, and recent evidence of peer-reviewed publication potential. Prior to admission of BCMB students, faculty advisors are responsible for developing a plan to financially support the student throughout the expected duration of their studies, including summers. These plans should be discussed with the student.

Facilitation and planning of coursework: Faculty Advisors shall provide students with advice on selection of courses that will both fulfill their degree requirements and enhance their mastery of a developing area of expertise. Expectations for each student shall be clearly mapped, including course work requirements, research seminars, laboratory meetings, examinations, thesis proposal, and thesis or dissertation. The faculty Advisor shall inform the student realistically of the appropriate amount of time required for service and completion of these expectations. Check Degree Progress periodically and particularly as graduation gets closer to make sure that the student's courses are all counting toward their degree as intended. Make any amendments that are needed. (For example, sometimes electives are not added automatically to the Electives section that counts toward the degree).

Evaluation of progress: Faculty Advisors shall evaluate student progress and performance in a regular and informative way. Evaluations shall explicitly inform students about their performance in relation to expectations for normal progress, and for timely degree completion and placement after graduation. Advisors shall prioritize student work assignments and projects towards successful completion of degree requirements and provide guidance that will deflect distractions and focus student efforts on important objectives.

Organization of Advisory Committee: Faculty Advisors shall provide guidance on the selection and assembly of the Advisory Committee. Faculty advisors shall ensure that students schedule regular committee meetings, that the BCMB Graduate Student Rubric is filled out at each meeting, that the student's ongoing progress is discussed, that the rest of the Advisory Committee has an opportunity to hear from the student directly, and that any barriers to the student's progress that may have arisen are detailed and resolved.

Promotion of scholarly and intellectual development: Faculty Advisors shall help the student develop and practice scholarship, intellectual curiosity, and the generation of valid and significant results. The faculty Advisor shall guide the student in asking important questions and help them devise hypotheses and methods to test them. The faculty Advisor shall help the student develop organizational, interpretative, analytic, quantitative, and laboratory skills appropriate for excellence in their academic discipline. The faculty Advisor shall educate the student about research ethics and record keeping and shall ensure that the student is familiar with Central Michigan University's policies on research integrity and conflict of interest. For Ph.D. candidates, the faculty advisor shall encourage students to seek potential grant or funding opportunities and to develop skills in grant writing and design. If appropriate, the faculty advisor shall seek out and/or provide opportunities for students to improve their teaching skills.

Support of students to attend conferences: Both M.S. and Ph.D. students are required to present their research at a regional or national conference. The amount of campus financial support for students tends to vary each year but may not be sufficient to fully defray the costs incurred by travel and registration fees. PIs should not expect students to use personal funds to attend research conferences and, instead, are encouraged to use grant funds when possible. Students are encouraged to apply for travel funds from societies, as well. If funds are limited,

students and faculty should seek out regional opportunities where costs are much lower.

Publication and dissemination of results: The faculty Advisor shall take primary responsibility for developing the student's skill in writing and presenting results. The faculty Advisor shall instruct the student on the proper methods of drafting, assembly, illustration, referencing, submission, and revision of manuscripts. The faculty Advisor shall inform the student of the criteria for authorship and of the hierarchy among authors on a manuscript or presentation. The faculty Advisor shall facilitate and encourage presentation at local, national, or international meetings.

BCMB forms: The Advisor will complete forms as listed in the Forms section of the handbook and ensure that all forms are submitted to the BCMB coordinator. These forms are required in order to document students' progress, for program-level assessment, and/or for Graduate Studies. In addition, the Advisor is required to perform iThenticate analysis of each advisee's thesis/dissertation before its submission and is encouraged to discuss the resulting report with the student.

Preparation for post-graduate life: Faculty Advisors shall assist students in preparation of individual development plans (IDPs) that will appropriately address each student's academic and career goals. Faculty Advisors shall provide students with information regarding employment opportunities available to graduates of the program and encourage planning towards an employment goal early in the course of study.

Lab environment: Faculty Advisors will work with lab members to create a lab environment that is physically and emotionally safe. Advisors will expect lab members to follow reasonable safety standards recommended by the Office of Laboratory and Field Safety. Advisors will also foster an inclusive environment where discrimination, harassment, and/or sexual misconduct by any lab member, including the Advisor, are not tolerated.

Moving between BCMB M.S. and BCMB Ph.D.

1. From M.S. to Ph.D.

• *Before M.S. Graduation*

A student interested in switching programs **from M.S. to Ph.D.** should first discuss their plans with their Advisor. After that, the student will convene an Advisory Committee meeting, at which the student lays out arguments and concrete plans for pursuing the new program. The Advisory Committee discusses the student's individual case and formulates recommendations. If the committee favors the student entering the PhD program, the student will assemble an application package consisting of a statement from the student explaining their interest in the Ph.D. program as well as the additional research experience gained thus far in the M.S. program, an unofficial copy of transcripts from the M.S. program, a letter from the Advisory Committee indicating approval for moving into the Ph.D. program, and an approved funding plan from the chosen Ph.D. Advisor. This application should be submitted to the BCMB program coordinator. In addition, an official application must be submitted through Admissions Processing. Work with the BCMB program coordinator to request a waiver for the application fee. The BCMB program committee will handle individual cases on a rolling basis. If the BCMB program committee approves the application, the student will then continue their trajectory as a Ph.D. student.

Generally, a student seeks to remain within the laboratory they started the M.S. research. In this case, the student's Advisory Committee would generally stay the same. This option should not delay the student's time to graduation.

However, it is possible for a student to also change laboratories at the time of switching programs. Depending on individual circumstances, such a switch might necessitate starting a new project and might incur additional time needed for graduation. Furthermore, a new Advisory Committee would need to be established.

• *After M.S. Graduation*

If a student intends to continue in the Ph.D. program after their graduation from the M.S. program, a standard application to enter the Ph.D. program is required. Completion of BCMB core courses during the M.S. will count toward the BCMB core coursework requirement for the Ph.D. Otherwise, the student will be considered to be in Year 1 of the Ph.D. program, will use the standard timeline for Ph.D. students, will begin a new research project, and will need to meet all of the thesis proposal submission and defense requirements of the Ph.D. program.

2. From Ph.D. to M.S.

Each case will be unique, and thus guidelines are intentionally broad. The student may seek the switch in program, or the student's Advisor and/or the student's Advisory Committee may recommend the switch.

A student interested in switching programs **from Ph.D. to M.S.** should first discuss their plans with their Advisor. After that, the student will convene an Advisory Committee meeting, at which the student lays out arguments and concrete plans for pursuing the new program. Analogously, the Advisor lays out arguments and concrete plans for pursuing the new program. The Advisory Committee will remain the same for the student's new course of study.

Students entering BCMB who hold a Master's degree in a related field from another institution

Students who obtained a Master's degree outside of CMU in a relevant field should work with their Advisor and Advisory Committee to determine how their previous work will impact their requirements for BCMB. Most often, students will still be required to take the core BCMB courses, but courses from the prior degree can fulfill elective requirements. These courses can be added as SCI credits, or if applicable they may be equivalent to an existing course at CMU. Typically, the time needed to complete thesis research will be similar for students entering with or without a Master's degree, unless the Master's research was closely related to the BCMB project.

Students not "ON TRACK"

The **BCMB Handbook** details the expectations for graduation, as well as the responsibilities of both students and faculty. The student's Advisor and Advisory Committee will monitor the student's progress closely and help the student to stay on track. This includes meetings with the Advisory Committee according to the schedule outlined in the Committees section, where comparing the student's progress along the rubric and timelines will reveal potential problems before they become an issue. Nevertheless, under individual circumstances, a student may find themselves to be off track. Below, the situations that constitute a "*not on track*" status are defined, and steps for remediation are specified.

Definitions:

M.S. students are considered to be "*not on track"* if any one of the following occurs:

- Required core courses are completed with an average grade below "B"
- A written prospectus is not submitted by the beginning of the 3rd semester within the program (e.g. fall of Year 2 for students entering in Fall or Summer)
- Defense of the prospectus is not successfully achieved by the second attempt
- A master's thesis is not submitted to the Advisory Committee within two years of the approved prospectus
- The master's thesis defense is not successful upon the second attempt

Ph.D. students are considered to be "*not on track"* if any one of the following occurs:

- Required core courses are completed with an average grade below "B"
- A thesis proposal is not submitted before the start of the 5th semester within the program (e.g. Fall of Year 3 for students entering in Fall or Summer)
- Defense of the thesis proposal is not successfully achieved by the second attempt
- A dissertation is not submitted to the thesis committee within 4 years of advancement to candidacy
- At the time of the dissertation defense, the student does not have at least 1 first-author or co-first author research manuscript that has been either published or submitted to a peer-reviewed journal and received positive feedback from the reviewers (i.e. peer review critiques indicating likely acceptance on re-submission)
- The dissertation defense is not successful upon the second attempt

Procedures:

Any Advisory Committee member may bring a "*not on track"* status to the attention of the BCMB Program Committee. In turn, the BCMB program committee will swiftly call an *ad-hoc* session and handle the case following the procedures outlined below:

Step 1: *Ad-hoc* BCMB Program Committee Meeting

The case of a student considered "*not on track"* will be heard by an *ad-hoc* session of the BCMB program committee. In addition to BCMB program committee members, the following personnel will attend: the student's Advisory Committee and a student representative (M.S. student for M.S. case; Ph.D. student for Ph.D. case; non-voting member). The BCMB committee will appoint the student representative. The student "*not on track"* will present a letter to all members before the meeting; the letter should give some explanation by the student as to why they are off track, and how they

envision getting “on track”. The student will then orally present their case at the *ad-hoc* meeting. After the student presentation, the *ad-hoc* committee members will discuss the case and formulate recommendations on how to get the student back on track, including an expected timeline. Majority vote will determine the course of action for the student. There is no appeal to this vote. The student’s Advisory Committee will meet bi-annually until the student is back on track, within the time limits set at the *ad hoc* meeting.

Step 2: Academic Probation

If the *ad-hoc* committee recommended a clear plan for the student to rectify any identified problems (in step 1), but the student was unable to get back on track in the expected timeframe, the student will be placed on academic probation until such time as the problem is dissolved. The BCMB program committee will determine a reasonable time frame for the probationary period, or the student may be dismissed from the Graduate Program.

Step 3: Dismissal from Graduate Program

After the probationary period determined in step 2, a student who fails to resolve the original problem(s) causing probation may be subject to dismissal. In this case, the BCMB program committee chair will notify the Graduate School Dean, and the student will be dismissed from the BCMB Graduate Program. Under extenuating circumstances, the program committee chair may petition the Graduate School Dean for an extension of the probationary time period.

A dismissed student is eligible to reapply for admission after one year. Approval or rejection of this application rests with the BCMB admissions committee.

CMU BCMB Program Policy on Use of Artificial Intelligence

The development of scientific communication skills is a core objective of the CMU BCMB graduate programs. These skills are developed in part through various writing activities within the BCMB programs, which include but are not limited to:

- Coursework writing assignments
- Prospectuses and research proposals
- Fellowship applications
- Research reports
- Journal articles
- Theses and dissertations

A variety of artificial intelligence (AI) writing and citation tools are available that can potentially be productively utilized in scientific writing activities. While students are encouraged to explore AI tools and develop an understanding of the strengths and limitations of these tools in scientific research, all students must adhere to the CMU policy on academic integrity and the following practices:

- Students must always prepare the first draft of any writing assignment
- AI may not be used to generate significant portions of writing (paragraphs, figure captions, etc.)
- AI cannot be used to generate figures
- AI tools may be used to assist in editing of student-written drafts (e.g., spelling, grammar, etc.)
    - The tool should be discussed with the advisor before use. Note that Microsoft Copilot is currently the only tool where CMU has a license and data is protected.
- Students must be fully transparent with their course instructor or advisor and committee about any use of AI in their writing
- Students must have original documents available, which may be analyzed and compared by the course instructor or advisor and committee
- If students use AI tools in their writing in a permissible manner, the AI tools must be acknowledged in the Acknowledgements section of the document
- Students may also explore the use of AI tools for literature searching, idea generation, and translation of writing they did in another language, but must always (i) be transparent about and acknowledge AI usage and (ii) critically evaluate and verify accuracy of outputs

If you have questions about use of AI writing tools in your coursework or research activities, consult with your instructor, advisor, and/or committee.

Other useful information

- If a student is not enrolled in coursework for more than a semester, access to CMU resources (such as email, OneDrive,…) may be suspended. Extended access can be requested through the Office of Graduate Studies. (Enrolling in research credits counts as coursework.) Students who do not enroll in coursework for 3 years must reapply to the program. Be aware that CMU policy limits how long you can take to complete your degree. The current policy can be found in the CMU graduate bulletin. In some cases, an extension of time can be requested.