UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

GRADUATE PROGRAM IN LIFE SCIENCES

Program in Molecular Medicine

Student and Faculty Mentor Handbook

2025 - 2026

UNIVERSITY OF MARYLAND GRADUATE SCHOOL
UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE

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This document is not a contract, and all information is subject to change at any time at the sole discretion of the Molecular Medicine Program.

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A Message from the Director and Track Leaders

We would like to take this opportunity to welcome you to the PhD Program in Molecular Medicine at the University of Maryland School of Medicine. You have been selected from among many exceptional applicants and we are excited that you have chosen to join our Program. The University of Maryland School of Medicine was established in 1807 as the first public medical school in the United States. It is now the fulcrum of a large academic health center that combines medical education, biomedical research, biotechnological innovation, patient care and community service. Located in the heart of metropolitan Baltimore, near the famous Inner Harbor area, the campus occupies modern building facilities and has state- of-the-art technology, offering unique training opportunities for graduate students. Graduate study in the Molecular Medicine PhD Program is governed by rules established by the University of Maryland Graduate School and the Graduate Program in Life Sciences (GPILS) in the School of Medicine. We encourage you to learn these rules, which are described in the most recent graduate catalog and on the web sites http://www.graduate.umaryland.edu/student-resources/ and http://lifesciences.umaryland.edu/. Additional program-specific rules and expectations are described in these guidelines, and are designed to answer most questions you may have regarding our program and the course of study. If after reviewing these guidelines you have any further questions, we encourage you to discuss them with us.

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The Molecular Medicine PhD Program (MMED)

The Graduate Program in Molecular Medicine at the University of Maryland is an inter-disciplinary program of study leading to a PhD degree. This program combines traditional areas of biomedical study, including Molecular Genetics, Genomics and Bioinformatics, Molecular and Cellular Biology, Pathology, Cancer Biology, and Physiology into a unique interdisciplinary research and graduate training program that is ideally suited for the training of scientists in the post-genomic era. The program faculty consists of more than 170 biomedical researchers who investigate a wide range of biological questions with relevance to human health. The Program has three different tracks: **Cancer Biology, Genome Biology, and Physiology**, each with tailored curricula of study.

The Cancer Biology Track

Cancer is a complex group of diseases, with ~2 million new cases and ~612,000 deaths in the United States projected to occur in 2024. The Cancer Biology Track offers an exciting and stimulating opportunity for students to pursue interdisciplinary cancer research using cutting edge technologies. The University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center, a National Cancer Institute-designated center, and its core facilities, researchers, and physicians provide a state-of-the-art environment for our students to conduct basic, translational or clinical cancer research. The primary objective of the Cancer Biology Track is to (1) provide students with a strong educational experience combined with modern research training that will enable them to make significant contributions to our understanding of cancer pathophysiology and (2) prepare students for the next phase of their career, whether that includes additional training as a Postdoctoral Fellow in a laboratory setting or direct employment in their field of choice.

The Genome Biology Track

The Genome Biology Track was developed to provide cutting-edge training in the areas of bioinformatics, genomics, genetics, and systems biology to study interesting biological questions related to human health. Although many of the track's mentors are members of the Institute for Genome Sciences (IGS), increasingly we have reached beyond the IGS to develop cross-disciplinary training and collaborative projects. Our students have done their dissertation work in diverse departments, centers, and institutes across the School of Medicine, working on projects involving the genomics of microbes and microbiomes, malarial genomics, cancer genomics, human population genetics, neuro-genomics, and a range of other research topics. Several of our faculty and their students also have participated in international consortium projects, including the Human Microbiome Project, the 1000 Genomes Project, and the TOPMed Project, where students have had opportunities to work on large team science projects. The IGS maintains three core facilities that help to fuel these projects, including: 1) The Microbiome Core, which provides assistance with high throughput microbiome analysis, 2) the Genomics Resource Center, which provides state-of-the-art high throughput Illumina and PacBio sequencing, and 3) the Informatics Resource Center, which provides access to high performance computing. Our graduates have pursued postdoctoral positions in academia (e.g., U. Penn, Sanger Center, U. Washington), industry (e.g., Glaxco Smith Kline, Personal Genome Diagnostics, Janssen Pharmaceutical), government (e.g., Food and Drug Association, National Institutes of Health), and intellectual property (ATCC tech transfer office).

The Physiology Track

The Physiology Track is specifically tailored to train the next generation of biomedical scientists to translate their molecular discoveries into broader, clinically relevant principles. Course work is designed to foster an integrative understanding of modern biomedical science. Thesis research projects combine modern tools of molecular and cellular biology strategies with state-of-the-art imaging and physiological and pharmacological techniques to illuminate key physiological or pathophysiological mechanisms. Our research programs are vertically integrated, offering opportunities to study how cells operate at molecular, cellular and organ-systems levels and elucidate how diseases are initiated and influenced by genetic variation, disease processes, and environmental stresses.

For more information on the program and each track refer to:
http:/lifesciences.umaryland.edu/moleculармedicine/.

For useful student resources, refer to: http://lifesciences.umaryland.edu/moleculармedicine/Student-Resources/.

A. Outline of Study

In the first year, graduate students will concentrate on required coursework and complete 3 laboratory rotations of 8-12 weeks each. Students will have the opportunity to attend Professors' Rounds sessions and student seminars to learn about the diverse research opportunities available. Before the end of the first year, all graduate students should have confirmed selection of their track and identified a mentor with whom to conduct research and thesis work. In the second semester of the first year and the first semester of the second year, students will be concentrating on advanced track-specific courses, elective courses and other requirements relevant to research interests and potential thesis research.

Midway through the second year, students will prepare to take the Qualifying Exam to be completed by April/May in order to be admitted to candidacy. The Qualifying Exam has two parts: (1) an original NIH- style research proposal (the science portion of the National Research Scholar Awards) and (2) an oral examination that tests knowledge and critical thinking. After successful completion of the oral Qualifying Exam, the student will apply to the Graduate School for admission to candidacy; and, in consultation with the mentor, establish a Thesis Advisory Committee of faculty advisors. Students should meet with their Thesis Advisory Committee a minimum of 2 times per year at which time they will review their research progress and their Individual Development Plan (IDP).

The student is expected to prepare a Thesis Proposal, in the style of a NIH research proposal, based on his or her preliminary doctoral research and present it to their Thesis Advisory Committee in a public seminar within 1-1.5 years after admission to candidacy. All students are required to regularly attend the MMED Student Seminar Series and present their research to their peers in this forum for academic credit. The final Doctoral Dissertation defense will consist of a public seminar followed by a private examination by the Thesis Advisory Committee. (Refer to the timeline in **Appendix 1** and more detailed information below). MD/PhD students enter the program as second year students and follow a similar program (refer to **Appendix 2** and **Section S** for MD/PhD and MD fellows program requirements). Throughout the program, students are expected to attend and participate in a variety of weekly seminars and workshops.

The MMED PhD track follows standard Graduate School performance requirements with regard to minimum grade point average, continuous enrollment, time to degree, advancement to candidacy and academic integrity. Students in the PhD Program are required to maintain a cumulative grade point average of 3.0 on a 4.0 scale. Students must register every fall and spring semester after consultation with their Track Leader, unless approved for a Leave of Absence by the student's advisor and the Program Director.

All students are expected to meet the highest standards of integrity. For further details, please visit the Graduate School Catalog and Policies Website.

B. Registration and Advisement

Course registration for the first semester will be handled by the MMED Academic Services Specialist. Students will be contacted regarding registration procedures well in advance of the start of each semester. Note that it is the responsibility of the student to make sure that registration for and enrollment in the correct courses takes place in a timely manner. Track Leaders should be consulted regarding course choices. When selecting courses, please keep in mind any track or training grant requirements as well as what seems most useful to the anticipated Doctoral Dissertation research area.

All graduate students are responsible for registering for classes each fall and spring semester. There are several steps to the registration process:

- Students should schedule meetings with their Track Leader at least 6 weeks before the start of each fall and spring semester.
- During the meeting, students should discuss the courses that they intend to take during the upcoming semester. The Track Leader should sign off on the student's Course Registration Request Form to indicate their approval of the desired course work. At this time Student Progress Form GRA I or Student Progress Form GRA II should also be completed.
- Once the course work for the following semester has been approved, a signed course registration request form along with the Student Progress Form GRA I or GRA II should be submitted to the MMED Academic Services Specialist who will then complete the registration. Please note that if there is an outstanding

balance on a student's account, the student will not be able to register. It is the student's responsibility to resolve the registration hold as soon as possible. If there are any difficulties resolving the hold, the student should inform the MMED Academic Services Specialist as soon as possible.

- Finally, students must log on to the SURFS website to ensure their registration is correct before the start of the semester.

For the first semester, each student will be assigned one of the Track Leaders as a formal advisor. At the end of the Core Course, all students will meet with the Program Director to discuss research interest areas and to finalize the most appropriate Track. Each student will then be assigned a permanent Track Leader based on research interests and desired courses. As the student's research interests develop and change, it is possible to switch tracks and thus also to change the Track Leader who is serving as the student's advisor. To change tracks after the second semester, the student will need to set up a meeting with the Program Director. However, students should note that it is desirable to settle on a track as soon as possible because each track has different course requirements to fulfill.

During the second year, the student will continue to be advised by their Track Leader, with the assistance of their chosen faculty mentor and/or any additional faculty assigned by the Track Leader. Students should continue to consult with their Track Leader as well as their mentor about course choices.

Once the Qualifying Exam has been passed and the student admitted to candidacy, the student and the mentor will establish a Thesis Advisory Committee of faculty advisors, subject to approval by the student's Track Leader and the Program Director. Regular meetings with the Thesis Advisory Committee at 6 monthly intervals are required and must be documented. The purposes of these meetings is 1) for the student to present their research project, update the Thesis Advisory Committee on progress and any changes to the research plan since the last meeting, 2) to seek the Thesis Advisory Committee's advice on the experimental plan and on the student's IDP plan, and 3) to establish when the student is ready to write up and defend their thesis. The student will continue to meet with the Track Leader prior to each semester for general advisement on progress and to register for 899 dissertation research credits.

C. Doctoral Student Funding

Offers of admission are made for a specific year and term. Accepted applicants are expected to enroll for the year and term for which they have been accepted. Deferral of admission to the Molecular Medicine Program will generally not be considered except in exceptional circumstances. Students accepted into the MMED PhD program are provided financial support via graduate research assistantships (GRAs), through several mechanisms such as GRAs awarded by the university, training grant funds, research grant funds, and individual pre-doctoral grant funds. Students are supported for the duration of their studies subject to satisfactory progress. Stipends are competitive nationwide and increase as the student advances. GRA support includes tuition, stipend and health insurance. Student fees are the sole responsibility of the student until they choose a lab. Once a dissertation mentor has been selected, the student's mentor will typically cover the cost of student fees.

As first year graduate research assistants supported by the university, students are expected to attend class, attend seminars and professor rounds, and perform lab rotations. By the end of the first year, students should have chosen a mentor and a laboratory in which to pursue dissertation work. Failure to do so can be considered grounds for dismissal. After 15 months, students on GRA support will transition to another source of funding, *e.g.* the research mentor's research grant funds or a training grant, which supports tuition, stipend and health insurance. If a student passes their qualifying exam during the initial GRA period, the date of the exam marks the end of their initial funding and the start on mentor's funds.

After transition to the mentor's research support, the student and the mentor should discuss the time expected to be devoted to GRA activities, sick time, vacation time, etc. Regardless of funding source, during lab rotations and later when working on dissertation projects, students are expected to devote 100 percent of their time and effort not spent on coursework into their research. As stated in the Graduate Assistant Guide, students are not formally eligible for vacation or sick leave policies applicable to faculty of staff. However, UMB shall allow each twelve-month, full-time GRA 10 Business Calendar Days of time away from duty per year. Additionally, UMB shall allow 5 Business Calendar Days per year of collegial leave for short-term illness and emergencies. Any additional leave

is granted at the discretion of the GRA's supervisor.

Requests for Internships must be approved by the Mentor and the Program Director prior to commencement, with the academic or career value, and time commitments clearly specified. Participation in Internships is subject to satisfactory progression of the student in their academic program. For further information about Graduate School policies, see the Graduate Assistant Guide under Financial Support forms at (http://www.graduate.umaryland.edu/Forms/).

D. Registration, Internal Payment Forms, and Tuition Remission

Registration: Graduate Research Assistants (GRA) must register as full-time students to remain eligible for stipend, tuition remission, and health insurance benefits each semester that they hold an assistantship. Students must register for 7 non-billable ABGA 900 credits during each fall, spring and summer semester, which indicates that the student holds a GRA. Full time student status is maintained by registering for a minimum of 9 credits during the fall and spring semesters. The 7 credits of ABGA 900 may count towards the 9 credits required for full time status, once the student's academic courses have been completed.

Further, students focused on their research will maintain full time status by registering for lab research credits: GPLS 898 (Pre-candidacy) or GPLS 899 (Post-candidacy). For those first- and second-year students who are still taking coursework, the 7 credits of ABGA 900 do not have to count towards the 9 credits to be full-time (i.e. 7 cr. ABGA 900, 8 cr. Core course plus a 1 cr. course still only equals 9 cr.)

Tuition Remission: Tuition remission forms must be completed each fall and spring semester.
Tuition may be remitted for up to 10 credits per fall and spring semesters, and not counting the non-billable ABGA 900 credits. If a student needs to register for credit during the summer semester, tuition cannot be remitted according to the Graduate School's policy.

During the first 15 months, graduate student assistants are responsible for completing and submitting an online tuition remission form each fall and spring semester before the Tuition Remission deadline. It is important that these forms be submitted on time. Late forms result in account holds and registration problems. If a first or second year student is on graduate school funds, payments for tuition will be completed by their payroll representative through an Internal Payment Form. If at any time a student is unaware of their funding source, they should contact the Academic Services Specialist to inquire.

After 15 months, and once a student transitions to being funded by a mentor, the mentor's funding administrator should be listed as the supervisor on the online tuition remission form. The Tuition Remission Form will then be automatically routed to the funding administrator to complete the form with an account code for payment.

Internal Payment Forms (to pay for fees and health insurance): An Internal Payment Form must be completed prior to both the fall and spring semesters **in order for the student to receive health insurance coverage.** Students must register for classes to generate a bill which students are responsible for providing to their mentor's funding administrator. The funding administrator will use this bill to determine amounts owed for health insurance and student fees. An internal payment form must be completed and submitted by the mentor's funding administrator at least 4 weeks before the start of the semester. Payment of registration fees and benefits will be covered by the mentor once a student has chosen a lab, in which case, these costs may be included on the internal payment form.

For further information on health insurance, fees and student accounting questions, visit http://www.umaryland.edu/financialservices/.

E. Coursework

The major coursework requirement for the first semester of study is the GPILS Core Course, *Mechanisms in Biomedical Sciences: From Genes to Disease (GPLS 601)*. The course is a comprehensive overview of current knowledge in cellular, molecular, and structural biology that is designed to provide the foundation for subsequent more specialized studies in biomedical research in any discipline. This course is provided in a concentrated format during the first 3.5 months of the Fall Semester. MMED students are expected to achieve a 'B' (3.0) or above in

this Core Course: a grade below 'B' in the Core Course can lead to dismissal from the Graduate School (see **Appendix 5** for policy). In addition to the GPILS Core Course, MMED students are required to take a 1 credit course that may be met with *GPLS 691, 692, or 693* depending on the student's interests.

In the spring semester of the first year and the fall semester of the second year, students take track-specific course requirements and electives (outlined in **Section Y** of this document). All MMED PhD students are also required to take *GPLS 647*: Molecular Medicine Survival Skills in the fall semester of their second year, which provides instruction in grant writing and review, manuscript preparation, and presentation skills. In addition, a course on scientific ethics is required of all students (*GPLS* 907 Research Ethics, offered during the spring semester).

Students are also required to register for 1 credit of GPLS 608: Molecular Medicine Seminar upon completion of their Thesis Proposal. See **Sections M** and **N** for more information regarding the seminar requirements. All graduate students are expected to maintain a 3.0 or higher grade point average throughout the course of their study. Failure to do so may result in academic dismissal.

F. Laboratory Rotations

All PhD students (regardless of the source of their funding) perform research rotations during the first year. Each student is required to participate in 3 laboratory rotations of 8-12 weeks each. In most cases, the first laboratory rotation should be arranged to begin in December (at the end of the Core Course), the second lab rotation should begin in March and the third lab rotation should begin by May. Eligible students can begin rotations in July and thus may complete their first rotation prior to the start of the Core Course and return to rotations upon completion of the course. Students should make a final selection of their dissertation mentor as soon as possible, and no later than the end of the summer of their first year.

Lab rotations provide students with opportunities to 1) identify an area of research that the student will pursue for his/her dissertation work; 2) identify a mentor who will guide his/her dissertation work, 3) identify a source of funding for the student's dissertation work; 4) learn how to function and flourish in a research laboratory setting; and/or 5) learn a specific skill (e.g., laboratory technique, statistical method) necessary for the dissertation work.

Rotations are a time of learning and growth, and the more time and energy students put into them, the more benefits they will reap in terms of new knowledge and expanding research and career opportunities. During the rotations, students work on projects that are mutually beneficial to the mentor and student. The student gains by learning new skills, techniques and ways of thinking; the mentor's research is enhanced by student observations and input. Students are encouraged to maximize the benefits of their rotations by 1) agreeing upon a project and expectations with their mentor at the outset; 2) paying careful attention to what's going on in the laboratory setting regarding his or her specific project and in general; 3) working hard; 4) working independently, but asking questions when they need help; 5) reading the literature recommended or assigned by the mentor and also obtained through inspired literature searches; and 6) maintaining regular communication with the mentor to discuss all that he or she is finding and learning along with challenges and pitfalls that inevitably arise when one is engaged in research.

Identifying a lab rotation:

In general, students should choose a lab rotation based on research interests, with the anticipation of pursuing their dissertation research in that lab. It is important to establish that the faculty mentor anticipates having funding to support the student for the duration of their dissertation research. Students should meet with the mentor to confirm that there is room for another student in the desired laboratory, to identify a likely project, and to clarify expectations about time commitment if the student is enrolled in coursework. During the first laboratory rotation, students should be exploring options for the second and third rotations, essentially following the same procedure as for the first rotation. If a match is found during the first rotation, it is possible to use the second or third rotation to learn a new set of techniques or problems, to help set up a possible collaboration, or to provide a backup choice of mentor. The Track Leader and the Molecular Medicine Academic Services Specialist must be kept informed of first year student progress and lab rotation selections.

There are several venues for new students to gain exposure to program faculty and their research activities, providing multiple opportunities which enable students to make informed decisions about lab rotations and the

selection of a dissertation mentor. During the fall semester, the MMED Program organizes "Professors' Rounds" consisting of informal approximately 20-minute talks by program faculty. The MMED Student seminars, in which more advanced students present their work, will also expose new students to the ongoing research in different laboratories. All students are required to attend the Professors' Rounds during their first semester and the student-run MMED Seminar Series each fall and spring semester until successful completion of the program. Students are also encouraged to utilize PI web pages, to contact faculty directly by email, and to attend one or more lab meetings of faculty labs in which rotations are being considered.

Selection of a lab rotation:
Students should meet with their Track Leader by the middle of the first semester to discuss possible options for their lab rotations. The selection of rotations is made by the student in consultation with the student's Track Leader, and it is based on the individual student's needs and the likelihood of sponsored funding to support the student's future dissertation work. Thus, students who have already identified their area of interest are encouraged to arrange rotations with one or more mentors in the identified research area who are likely to have research grant funds or training grant funds to support the student's future dissertation work. Students who do not yet have a preferred research area are encouraged to identify rotations with one or more mentors who work in fields of potential interest and who are likely to have research grant funds or training grant funds to support the student's future dissertation work. All students may choose, with the consent of their Track Leader, to do one rotation whose goal is to learn a specific skill.

Once a rotation has been selected, the student completes a lab rotation proposal form in collaboration with the rotation mentor, outlining the goals of the rotation. The form is reviewed, signed by the appropriate Track Leader, and submitted to the Academic Services Specialist. At the end of each rotation, the student submits a lab rotation evaluation form to the Track Leader for approval. This provides students with an opportunity to evaluate the rotation experience and assess the extent to which the goals were attained. Once the Track Leader has signed off, the Academic Services Specialist must also receive a copy of the approved lab rotation completion form for the student's file. Mentors may also be asked for their evaluation of the student's lab rotation. Credit for completion of all 3 lab rotations is obtained by formally registering for Lab Rotations (GPLS 609; 1 credit) in the fall semester of the second year, when the student will be given a pass/fail grade after completion of all 3 lab rotations. Students will not receive credit for lab rotations until the completion forms are submitted to the Academic Services Specialist.

G. Seminar Attendance

All MMED Students are required to attend the student-run MMED Seminar Series throughout the course of their PhD study. In addition to providing a format for students to gain presentation skills and to meet their seminar requirement, this seminar program is an excellent opportunity for first year students to identify areas of research interest. They also provide a forum for all students to identify possible research collaborations and/or sources of technical assistance. Attendance is taken and any absences must be explained to the Faculty Director *prior* to the scheduled seminar. Students must follow the policy laid out by the Course Director for absences each year. In addition, students are encouraged to attend Departmental Seminars, Journal Clubs and various other Interest Group meetings.

Thesis Proposal Seminar- 1 credit of GPLS 608: Molecular Medicine Seminar (See also **Section M**): Within 12-18 months of admission to candidacy, the student prepares a written Thesis Proposal and presents it in a public seminar to their Thesis Committee and to other interested parties. The student is responsible for scheduling this Thesis Proposal Seminar and the Thesis Advisory Committee Meeting afterwards, and for notifying the Molecular Medicine Academic Services Specialist of the logistics so that the seminar can be publicly advertised. Provide the presentation title, mentor name, date, time and location of the seminar to the Academic Services Specialist at least 2 weeks prior to the seminar date. The Thesis Proposal Seminar should be prepared as a 30–40-minute formal seminar in which the student orally presents the written Thesis Proposal. The seminar should include an introduction setting up the research problem and then clearly articulate the hypothesis to be tested, each of the specific aims, the student's data in support of the aims, and the experimental plan for each aim going forward. The purpose of the Thesis Proposal Seminar is to lay out the proposed plan of research so that the Thesis Advisory Committee can assess feasibility and provide constructive feedback at this early stage of the research.

Molecular Medicine Seminar (See also **Section N**): The Molecular Medicine Student Seminar should be a 30-40 minute seminar such as you would present at a formal meeting/conference or job interview. The seminar should tell a story. It won't be a complete story, but there should be an appropriate introduction, a statement of the specific problem that is being addressed, the student's hypothesis and how it was derived, the data obtained, how the data addresses the problem and its impact on the field of study. The student should explain concepts clearly, since the audience is of varied expertise. Seminar presentations should allow time for questions and discussion, and will be critiqued by course faculty and student peer review. The peer review panel presentation criteria are outlined in **Appendix 4**.

H. Choosing a Track and a Mentor

First year students will be advised by a Track Leader assigned to them at the beginning of the first semester. They will be asked to verify selection of their track from among the three tracks in the program (see **Section Y**) at the end of the first semester, in order to be appropriately advised on advanced track-specific and elective courses. By the end of the first year in the program after completing their laboratory rotations, each student will be formally asked to confirm their track from among the three tracks in the program and to identify their research faculty advisor (mentor) from among the required three lab rotations. It should be noted that some mentors are listed under more than one track, and mentors not yet in the MMED program may join the MMED Program. It is possible to switch from the initial track selection so long as the required courses have been taken. Once a mentor has been selected, he or she must read and complete the MMED Mentor Agreement obtained from the Academic Services Specialist.

Note that the selected mentor must be a Regular Member of the Graduate Faculty. If the mentor is not a Regular Member, but is an Associate Member, the student must have a co-mentor who is a Regular Graduate Faculty member. As per Graduate School policy, *"A PhD student must establish and maintain a professional relationship with a member of the Graduate Faculty with the appropriate knowledge and expertise to serve as his or her research advisor. If no appropriate Graduate Faculty member is available or no appropriate Graduate Faculty member agrees to be the student's research advisor, the student cannot continue in the PhD program."* A list of Graduate Faculty members can be found at: https://www.graduate.umaryland.edu/About/Faculty/Graduate-Faculty/.

It is the responsibility of the student to identify a mentor who is able to provide both financial and research mentoring support beginning after the first eighteen months of graduate study through to the completion of the dissertation. However, students are also encouraged to apply for individual funding through competitive pre-doctoral grants offered by the NIH, the Department of Defense, the American Cancer Society, the American Heart Association or other agency sponsors. In addition, students may be eligible for support on one of the many institutional Training Grants at UMB (see **Section Z**) with which his or her mentor is affiliated. These options should be discussed with the student's mentor and Track Leader. Note that some training grants have specific course requirements, so potential training grant funding should be considered during course selection.

I. Individual Development Plan

After selecting a mentor, the student should complete an Individual Development Plan (IDP) and discuss the plan with their mentor. The student should review all sections of the document and provide their completed responses to their faculty mentor prior to a scheduled review meeting. During this review meeting, both parties will discuss the trainee's responses, and any professional development recommended in order to achieve the student's long-term goals. The IDP Plan is a dynamic document that should be updated as the student progresses through the program. The specific goals of this review process are to: (1) identify the trainee's short-term research project goals to promote enhanced productivity, (2) identify the trainee's professional development needs to foster career growth, and (3) help ensure trainee expectations and goals are aligned with their faculty advisor.

Moving forward, all students admitted to candidacy should update their IDP prior to each Thesis Advisory Committee meeting and present it in written form for discussion with their Thesis Advisory Committee every six months, after the normal review of scientific progress. This is also a good time to update your CV. The Thesis Advisory Committee should provide written comments and recommendations concerning the research progress and the IDP prior to signing off on the review committee form. The purpose of these reviews are to: (1) provide constructive feedback to graduate students regarding their progress during the past year, (2) identify the trainee's

short-term and long-term research goals to promote enhanced productivity, (3) assist in identifying the student's professional development needs to enhance career growth and outcomes, and (4) to target areas for improvement. It is the responsibility of both the student and the mentor to ensure that these discussions take place. The Graduate Program in Life Sciences may require more frequent modifications to the IDP in addition to the program's policies.

J. Qualifying Exam and Admission to Candidacy

In order for a student to eligible to take the qualifying exam and be admitted to candidacy, several conditions must be met:

1. Complete program/track course requirements with a minimum 3.0 grade point average. Any student not in good standing or on probation is not eligible to take the qualifying exam and be admitted to candidacy.
2. Prepare a defensible NIH-NRSA style research proposal (science portion only), up to 7 single spaced pages (1-page specific aims and 6 pages body of grant) plus reference citations.
3. Pass an oral examination.
4. Complete any other track-specific requirements.

These conditions are expected to be met no later than May 30th of the second year for PhD students and no later than September 30th for MD/PhD students.

The purpose of the qualifying examination is to test the student's readiness to make the transition from classroom training to thesis research. Students will be expected to demonstrate knowledge of general topics in molecular medicine and topics that derive from their academic coursework, as well as their ability to recognize and address significant research problems by formulating coherent, well controlled experimental designs.

The complete guidelines for the Qualifying Exam are provided in **Appendix 3** and are briefly described here. The Qualifying Exam consists of two parts and is structured as follows:

1. Grant Writing Component

The student will be required to prepare a NRSA-style application as outlined in **Appendix 3**. The research proposal must be the original ideas and work of the student. The topic of the proposal may be related to the student's pending dissertation project but can also be an alternative topic of the student's choice. The purpose is to test the student's ability to develop an original hypothesis and to design feasible experiments to test that hypothesis. No preliminary data are required. Students are permitted to seek advice and consult their advisor or other experts with specific questions, but the proposal must be the student's own. The student must certify the proposal as his or her own work on the cover page. The written proposal will be submitted to the Track Leader who forwards it to the Qualifying Examination Committee, which will consist of 5 faculty members appointed by the Track Leader, plus the student's mentor as a non-voting observer. The Track Leader must serve as the chair of the Qualifying Examination Committee and may also serve as an examiner. If the Qualifying Examination Committee judges the written proposal satisfactory, an oral exam will be scheduled by the student.

2. Comprehensive Oral Exam

The students will give a 2–3-minute overview of the project they propose to start the exam. As directed by the Track Leader, each examiner, in order, will ask a line of questions through 2 rounds of examination. Questions will relate to general knowledge of topics in molecular medicine, with some focus on topics derived from the student's academic coursework as well as their written proposal. Questions will also relate to the student's written proposal, their ability to evaluate the literature and formulate a testable hypothesis, to select appropriate methods, to design well controlled experiments, and to interpret experimental data. Students should be able to justify their choice of problem, the methods to be used to attack it, what given results might mean, what might go wrong, and to describe alternative approaches. The objective of the oral examination is to detect and probe areas of strength and weakness; thus, students may not be able to answer all that they are asked.

The examination process is designed to ensure that students have a fundamental understanding of topics in molecular medicine and can design a coherent series of experiments addressing a particular topic; therefore, the experiments proposed in the written component should be well-considered, well-controlled, and backed up by alternative approaches. Students should be able to predict and interpret the potential outcomes, and to place

the outcomes in the context of how they move the field forward. Since the oral examination tests the 'ability to think on one's feet', students are strongly encouraged to hold informal 'mock examinations' involving their laboratory colleagues, prior to their oral examination.

During the closed oral portion of the exam, students will be tested on their understanding of the proposal as well as their general knowledge of related topics in molecular medicine. After the oral exam is finished, the student will be asked to leave the room, and the mentor will be given an opportunity to address the committee. In the absence of the student and the mentor, the Qualifying Exam committee will decide the outcome by majority vote (see **Appendix 3**). Students who do not pass the Qualifying Exam the first time will be given only one additional opportunity to re-take and pass the exam. Successful students are encouraged to further develop their written proposal, supplemented with preliminary data, for submission to the NIH or another funding agency (e.g., the American Cancer Society or American Heart Association).

After successfully passing both portions of the Qualifying Exam, the completed Qualifying Examination Form (**Appendix 3**), including all signatures, should be submitted to the Academic Services Specialist. Each successful student should also initiate the paperwork for admission to candidacy and will need to obtain the signatures required by the Graduate School on the application form: http://www.graduate.umaryland.edu/Forms/ and submit the completed application to the Graduate School. Students should ensure that copies of the final approval letter from the Graduate School are provided to 1) the Academic Services Specialist and 2) their payroll officer, so that their Graduate Research Assistantship can be raised to the next pay step.

K. Thesis Advisory Committee

Once admitted to candidacy, students must choose, with the help of their mentor, a Thesis Advisory Committee (Doctoral Dissertation Committee) of 6 faculty members, including the mentor.

The student and mentor, within 6 months of admission to PhD candidacy, should discuss potential Thesis Advisory Committee members and obtain the Track Leader's approval prior to finalizing the committee membership. The UMB Graduate School policy allows the Doctoral Dissertation Committee to consist of 5-7 faculty members, including the mentor. **The MMED Program requires that the Thesis Advisory Committee be formed with at least 6 members, including the mentor.** One of the members must be an external member from outside of the MMED Program, preferably external to the School of Medicine or to the University itself. MSTP students are required by the MSTP program to have at least one member of the MSTP Advisory Committee on their Thesis Committees; otherwise, the Committee structure and responsibilities are the same for MSTP students as for the PhD students. As the student progresses, if one of the 6 members of the student's originally constituted Thesis Advisory Committee can no longer participate, the Mol Med policy is that the member does not need to be replaced, as 5 members (including an external member) will be accepted by the Graduate School as the minimum Doctoral Dissertation Committee.

Any changes made to the original composition of the Thesis Advisory Committee must be submitted on a Thesis Advisory Committee change form and approved by the Track Leader and Program Director. The approved committee change form plus any accompanying documentation must be provided to the Academic Services Specialist to file in the student files. At least 6 months prior to the final thesis defense, the names of the members of the Thesis Advisory Committee should be submitted for approval by the Graduate School by the student and will constitute their Doctoral Dissertation Committee. The required 'Nomination of Members of Final Doctoral Examination Committee' form can be found at: http://www.graduate.umaryland.edu/Forms/.

L. Thesis Advisory Committee Meetings

Students are expected to meet with all members of their Thesis Advisory Committee every 6 months.

The Track Leaders, Program Director or members of the Thesis Advisory Committee may also recommend more frequent meetings in certain cases. The purpose of these meetings is to discuss strengths and weaknesses and to help the student organize the research and set appropriate goals. These meetings are designed to assist students in the progression of their research, not for the sole purpose of presenting data. Prior to the Thesis Advisory Committee meeting, the student should update their IDP and present it in written

form to committee members for discussion during their committee meeting. For the Thesis Advisory Committee Meeting, the student should prepare a presentation outlining their hypothesis, and specific aims and present their data for review of scientific progress and discussion of the results. Following this, a discussion of the IDP should occur relating to the student's professional development needs to enhance career growth and provide suggestions for areas of improvement. The Thesis Advisory Committee should document recommendations concerning the research progress and the IDP prior to signing off on the review committee form.

It is the responsibility of the student to initiate and to organize Thesis Advisory Committee meetings every 6 months or more often if required. The date and time set by the student for the committee meeting must be acceptable to all members of the Thesis Advisory Committee. A committee member can participate electronically (e.g. Zoom), if they have real-time visual and oral communication ability. In the rare event that a personal issue or unexpected occurrence prevents a committee member from attending a scheduled Thesis Advisory Committee at the last minute, it is acceptable (but not recommended) to still hold the meeting with 5 committee members. In this case, the absent committee member must be updated personally by the student on their research progress, their IDP and on any recommendations from the Thesis Advisory Committee that the committee member missed. **Note that this exception does not apply for the Thesis Proposal and Dissertation Defense where all 6 committee members must be present.** A committee meeting cannot be held with less than 5 members. **Significant delays in holding Thesis Advisory Committee meetings can result in a hold on the student's registration.**

In an effort to provide our students with a forum to discuss concerns related to interactions with their mentor or their progress towards graduation, all thesis committee meetings should conclude with a short discussion between the student and the rest of the committee. Mentors will be asked to step out of the room, in the same way that students are usually asked to step out of the room at the beginning of a committee meeting. Minor issues should be dealt with by bringing the mentor back into the room, while major issues should be forwarded to the program's attention. Verification of student thesis committee discussions should be indicated on the thesis meeting record.

The written summary and evaluation of the student's progress must be provided on the post-candidacy committee meeting record and individual development plan (IDP) from, and all committee members signify their approval by their signature. The completed form must be submitted to the Track Leader and then the Program Director for signature approvals after each committee meeting. Students encountering any problems with their mentor and/or project should consult the members of their Thesis Advisory Committee, their Track Leader and/or the Program Director at an early stage, so that problems can be resolved in a timely manner.

Students should schedule their final Thesis Advisory Committee meeting 3-6 months before they plan to defend their dissertation. At this meeting, the student will need to obtain permission from all committee members to write up and schedule the Dissertation Defense. Committee members should initial in the appropriate column on the post-candidacy meeting record form to signify their approval.

M. Thesis Proposal

Within 12 to 18 months after admission to candidacy and at least 12 months prior to the final Dissertation Defense, in order to promote confidence that the planned research project is viable, students must:
1. prepare a Thesis Proposal (NIH NRSA or F31 format) and
2. present their Thesis Proposal in a publicly advertised seminar to their Thesis Advisory Committee and to other interested parties (ordinarily members of their track and of their host department).

Under no circumstances should the Thesis Proposal occur less than 12 months prior to the anticipated final Dissertation defense.

The writing, presentation, and questions associated with the Thesis Proposal have multiple aims, which include improving students' grant writing and oral presentation skills as well as helping to ensure a feasible research plan and efficient progression of the dissertation research. The latter end will also be served by subsequent meetings of the Thesis Advisory Committee at regular intervals. The intent of the Thesis Proposal is to take minimal time from research while still fulfilling these aims. This intent can be served when the Thesis Proposal is an expanded and updated version of the written Qualifying Exam proposal, supplemented with preliminary

data. It is sometimes the case that 1-2 aims of the Thesis Proposal have already been completed or are partially completed at the time of writing the Thesis Proposal. These aims should be written up in the research plan as proposed experiments, and a note added describing the status of the aim (*e.g.* stating that the aim is either fully or partially completed and describing what is left to complete). Thus, it is the intent that the content of the Thesis Proposal stands as an early draft of the Doctoral Dissertation. However, it is recognized that the specific aims presented in the Thesis Proposal at an early stage of the research will likely be modified as additional data is obtained and the research progresses, prior to the final Dissertation.

It is anticipated that the Thesis Proposal will frequently provide a basis for an external grant application and eventually the final Doctoral Dissertation. Therefore, the written proposal should be prepared early enough to submit it as a grant application, receive feedback and potentially be awarded funding for the duration of the research project.

The student will present the Thesis Proposal, a publicly advertised seminar presentation and include the Thesis Advisory Committee in the audience. The structure of this presentation should be along the lines of the written proposal, that is, introduction and background, hypothesis, significance, specific aims and what has been accomplished under those aims, and future research directions/experimental plan. After the oral presentation, the student will meet in private with the Thesis Advisory Committee and answer questions concerning feasibility, impact, interpretation, and addressing other potential concerns as per a normal Thesis Advisory Committee meeting. Please note that this is not a test of student knowledge. **The Thesis Proposal Seminar cannot be presented within the Molecular Medicine Student Seminar Series and should be scheduled prior to the student's research presentation in the Molecular Medicine Student Seminar Series.**

The written Thesis Proposal should follow the format of a NIH NRSA or F31 application, typically 7-12 pages, excluding references. See https://researchtraining.nih.gov/programs/fellowships A written proposal previously submitted to an extramural funding agency may serve as the basis for the Thesis Proposal. Students should submit their written proposal to their Thesis Advisory Committee members at least 2 weeks in advance of their scheduled Thesis Advisory Committee meeting. In addition, advertising for the oral presentation should be coordinated through the Academic Services Specialist at least 2 weeks in advance (see **Section G**, Thesis Proposal Seminar).

The Thesis Advisory Committee will determine whether the written Thesis Proposal is satisfactory and whether the oral presentation fulfills the seminar requirement for *GPLS 608*, or whether additional requirements need to be met. The outcome of the Thesis Proposal should be documented on the Thesis Proposal form, faculty signatures obtained, and the completed document submitted to the track Leader and Program Director. It is the responsibility of the student to register for 1 GPLS 608 credit the semester following the successful completion of the Thesis Proposal.

N. MMED Student Seminar Presentation

Beginning in the third year, students are required to present a formal seminar at the student-run Molecular Medicine Seminar Series. Junior students (3rd and 4th year PhD students/2nd and 3rd year MD-PhD students) will present a 25–30-minute seminar, while senior students (5th year) will be required to present a 45–50-minute seminar. The structure of this seminar should be such that it tells a story of the research, such as would be presented at a formal meeting/conference, the thesis dissertation or job interview. This seminar is different from the Thesis Proposal presentation. At this stage, it is expected to be a near complete rounded-out story and serve as a prelude or first practice for the final thesis defense. Peer- review is provided so that the student can hone the seminar presentation in anticipation of their thesis defense. Additional details are provided in Appendix 4.

O. Preparation for Doctoral Dissertation

Students are expected to meet regularly with their Thesis Advisory Committee to review progress and obtain valuable input. Decisions about the scope of the dissertation should be reachable by consensus. The MMED Program requires a minimum of 1 first author original research publication as an outcome of the student's Dissertation research, accepted or published in a peer-reviewed journal prior to the thesis defense. Co-first authorship is considered meeting this requirement if accepted by the mentor and the Thesis Advisory Committee and the work originates from the student's dissertation project. Our most successful students generally have

multiple first author and/or co-authored publications.

The Thesis Advisory Committee is responsible for deciding when the dissertation is ready for defense. This decision is based on a detailed evaluation of the student's research progress - including all tables, figures and data analyses as well as a review of published papers - in a final Thesis Committee Meeting. The Thesis Advisory Committee will determine if additional research or training is required, or whether the student is ready to defend her/his dissertation. Students may formally begin to draft their thesis and plan for their formal Public Dissertation *only after receiving written approval* from the Thesis Advisory Committee signified by indication that 'this is the final Committee meeting before defense' on the Post-Candidacy Committee Meeting Record.

P. Doctoral Dissertation

The Doctoral Dissertation is expected to be an original contribution to scholarship or scientific knowledge and to exemplify the highest standards of the student's discipline. The dissertation is the culmination of a training process designed to prepare the student to conduct independent research. The successful completion of the dissertation provides proof that the student has the ability to ask significant questions, develop appropriate, detailed approaches to addressing these questions and that the student can effectively gather and interpret data. Any data or contribution by anyone other than the student must be acknowledged in the dissertation and in the oral seminar. This information may be included in the acknowledgements section, in the relevant figure legends or in the text of the dissertation, as most appropriate.

Time Limitations: Students must complete the entire program for the doctoral degree, including the dissertation and final examination, during a four-year period after admission to candidacy, but no later than nine years after admission to the doctoral program. Under certain circumstances, time extensions may be granted by the Graduate School as outlined below. Admission to the degree program terminates if the requirements are not completed in the time specified. Time taken for an approved Leave of Absence for Childbearing, Adoption, Illness or Dependent Care is not counted in these time limitations.

Once the student is preparing to write their thesis, they should consult the Graduate School website for the current forms and deadlines for graduation. For clarification on any of the information provided students should consult http://www.graduate.umaryland.edu/student-resources/ or call the Graduate School at 410- 706-7131. The student must be registered for at least one credit in the period in which they intend to graduate, including summer and winter sessions, and must have been registered overall for a total of at least 12 doctoral dissertation research credits (*GPLS 899*) as well as having completed a successful Dissertation Defense. It is the responsibility of the student to follow and meet all Graduate School deadlines. Please note that the first deadlines occur 6 months prior to graduation and plan accordingly.

The Doctoral Dissertation and Thesis Style Guide is available on the Graduate School's website. Students are expected to carefully read and follow these guidelines as the final dissertation is being prepared. The Dissertation consists of an Introduction, several chapters presenting research results and a Discussion. The Introduction should include a thorough review of the literature and a general justification for the research project. Each chapter should include an introduction and justification for that particular experiment, unique methods, results and a discussion. A comprehensive final chapter should review the findings presented in the chapters, integrate them with each other and place them in the larger context of the existing literature. Questions left unanswered or identified for future exploration should be elucidated. Prior publication of findings in peer reviewed journals will facilitate final preparation of the dissertation and is strongly encouraged.

The Doctoral Dissertation should be completed and reviewed by the mentor at least 1 month prior to the anticipated defense date. The student should allow 2 weeks for the readers to provide comments, and then a minimum of an additional 2 weeks for review by the entire Doctoral Dissertation Committee. At least 2 weeks prior to the proposed examination date, the Certification of Completion of the Doctoral Dissertation form should be completed and signed by the mentor and the readers. The student should then make an appointment with the Program Director and bring the signed Certification of Completion of the Doctoral Dissertation form, the completed Alumni form, and the completed MMED Checklist certifying completion of all Molecular Medicine program requirements, for her signature. This form then must be submitted to the Graduate School, and the thesis abstract for the Announcement of the Doctoral Dissertation Defense uploaded on the Graduate School website.

The Dissertation Defense will consist of a public seminar, announced campus-wide, and will be followed by a private examination of the candidate with the Doctoral Dissertation Committee (composed of the members of the Thesis Advisory Committee). It is crucial that the student reserves a time slot, along with the committee, of at least 3 hours for the dissertation defense. At this meeting, committee members may discuss with the any issue related to the dissertation. This may include, but is not limited to: challenges encountered, approaches considered to address problems, appropriateness of experiments, limitations of the approach, alternative interpretations of results, and future directions. The Committee will meet briefly in private to vote and will then immediately inform the candidate whether or not the defense has been accepted. If the committee decides that the thesis or thesis defense is not acceptable, the candidate will be given one more opportunity to pass.

Q. Transfers into the MMED PhD Program

GPILS PhD students who wish to transfer from another program of GPILS into the MMED Program are required to meet all of the MMED Program's admissions requirements upon application. Applications will be reviewed and must be approved by the MMED Leadership. If the transfer is approved, the transferring student must then meet all of the curriculum and program requirements of the MMED program, which may require additional coursework and thus, a lengthier stay in GPILS.

Doctoral students who have previously advanced to candidacy and who apply for transfer must 1) demonstrate that their knowledge is current and consistent with those standards that are in effect in the MMED program and 2) must be supported by their research mentor's research grant funds or a training grant, which supports tuition, stipend and health insurance. The program will determine what constitutes an acceptable level of current knowledge on a case-by-case basis. This could mean that the student will be required to take additional coursework, retake the comprehensive examination or otherwise demonstrate that the student's knowledge is consistent with current standards of the MMED program.

R. Application Requirements for University of Maryland Graduate School Master's Degree Students

The Master's Programs at the University of Maryland are independent from the MMED PhD Program. Students in the Master's Programs who wish to be considered for admission to the MMED PhD Program must apply for consideration along with the regular applicant pool by the admissions deadlines. Master's students who do not receive a grade of "B" or better in the GPILS Core Course (GPLS 601) and a GPA of 3.0 or above in their Master's coursework will not be considered for admission. Master's degree coursework may be applied to satisfy the requirements for the PhD degree; however, the credit must not have been used to satisfy Master's degree requirements.

S. MD/PhD and MD Fellows Program Requirements

MD/PhD students and MD Fellows enter the graduate program essentially as second year graduate students. MD/PhD students are required to complete 2 laboratory rotations within the Program. These are normally completed during the summers of the medical school pre-clinical years. One or more years of prior research experience and/or completion of other research rotations during medical studies may constitute grounds for exemption from the second rotation requirement, at the discretion of the MMED Program Director. The rotation requirement may be waived for MD Fellows. Since MD/PhD students and MD Fellows enter the graduate program as second year students, they are not required to take the first year GPILS Core Course, but they must complete Track-specific courses (see **Section S**). Specific academic programs tailored to the requirements of MD fellows who enter the MMED PhD Program may be approved by the MMED Leadership. Credit may be given for courses which overlap with medical courses at the discretion of MMED Leadership (refer to the timeline in **Appendix 2**). MD/PhD students are expected to prepare for their Qualifying Exams upon completion of their Spring semester coursework and to complete the Qualifying Exam before the end of their first year.

T. Student Academic Misconduct

Students pursuing a PhD in Molecular Medicine are expected to perform within the norms of academic and scientific ethics. Please refer to the Graduate School policies regarding academic misconduct at http://www.graduate.umaryland.edu/policies/. Plagiarism is a common form of academic misconduct. A student can be accused of plagiarism if he or she quotes someone else, either verbatim or in extensive paraphrasing, without proper citation of that quote. In preparing for a classroom assignment, if you are not aware of the proper

procedure in avoiding plagiarism, please discuss this with your mentor, the Course Director or your Track Leader.

U. Responsibilities as a Graduate Research Assistant (GRA)

As a Graduate Research Assistant in the first year, you are expected to attend classes, attend seminars, and perform laboratory rotations. By the end of your first year, you should have chosen a mentor and lab in which to pursue your thesis work. After 15 months, you will be supported by your mentor and thus you should discuss with him/her time expected in the lab, sick time, vacation time, etc. Please review the Graduate Assistant Guide. While you are not eligible for formal vacation or sick leave, mentors have their own policies which may allow such flexibility. The granting of these benefits is at the discretion of your mentor. As a Graduate Research Assistant, students are expected to devote 100 percent of their effort after the completion of their coursework to their studies and research and may not be employed in any other capacity.

V. Student Stipends, Fees, Tuition and Benefits

Student stipends are determined by the Graduate School and revised each academic year (September 1-August 31).

The current stipend levels are as follows:

Level I	$34,325
Level II	$36,325 (following admission to candidacy)

Graduate Research Assistants must register as full-time students to remain eligible for stipend, tuition remission, and health insurance benefits each semester and session that they hold an assistantship.

W. Graduate Student Association (GSA)

Students are encouraged to participate in the GSA, which offers special services for graduate students, including grants for lab supplies, travel fellowships, and use of laptop computers. For more information regarding the GSA and the names of your representatives, please consult the GSA web site. If you are interested in becoming an active member or representative in the GSA, please email them at gsa@umaryland.edu for further information.

X. Professional Career Development Opportunities for Graduate Students

Students are encouraged to participate in professional development activities. The MMED Program seeks volunteers to represent the MMED Program on various committees, to participate in Molecular Medicine Seminar Peer Review panels, and activities associated with Spring recruitment, new student orientation in the Fall, Core Course tutoring, etc. Please contact the Academic Services Specialist for more information and to express your interest.

GPILS offers a variety of training experiences and career development opportunities to enrich the long-range outcomes of students and postdoctoral researchers. These include NRSA grant writing training opportunities, scientific leadership and project management, communicating your research, effectively using PowerPoint, networking for career success, CV/resume writing, conducting a job search and interviewing, and much more.

For additional information, see the Career Development page and/or contact **Jennifer Aumiller**, Director of Career Development.

Y. Molecular Medicine Curriculum

Requirements for all Molecular Medicine PhD Students

- GPLS 601 Mechanisms in Biomedical Sciences - GPLS Core Course (Fall, 8 cr)
- One of the following courses:
  - GPLS 691 Current Topics in Neuroscience (Fall, 1 cr)
  - GPLS 692 Current Topics in Genome Biology (Fall, 1 cr)
  - GPLS 693 Introduction to Molecular Microbiology and Immunology (Fall, 1 cr)
- GPLS 907 Research Ethics (Spring, 1cr)

- GPLS 647 Molecular Medicine Survival Skills (Fall, 2 cr)
- *(Strongly recommended)* GPLS 630 Fundamentals of Biostatistics (Spring, 3 cr)

Lab Rotations

- GPLS 609 Lab Rotations Mol Med (Sec 02, 1 cr, P/F)[1] *Students register for lab rotation credit after completing all 3 rotations*

Seminar Credits (1 seminar credit must be earned before graduation):

- GPLS 608 Seminar Mol Med (Sec 02, 1 cr, P/F) *Students register for credit in the semester after they defend their Thesis Proposal.*

Research Credits

- GPLS 898 (Pre-candidacy) or GPLS 899 (Post-candidacy)[1]. *Students must have at least 12 dissertation research credits (899) in order to graduate.*

Additional Course Requirements by Track

Students are expected to enroll for an additional 6-8 academic credits/semester (this excludes GPLS 647: MMED Survival Skills and GPLS 609: Lab Rotations). At the time of the Qualifying Exam, PhD students should have received credit for a total minimum of 21 academic credits and MD/PhD students a total minimum of 12 academic credits.

1.) Required Track-Specific Courses:

Cancer Biology	Physiology	Genome Biology
GPLS 790 Advanced Cancer Biology (Spring, 3 cr) GPLS 665 Cancer Biology: From Basic Research to the Clinic (Fall, 3 cr)	GPLS 645 Cell and Systems Physiology (Spring, 3 cr) GPLS 630 Fundamentals of Biostatistics (Spring, 3 cr) GPLS 750 Topics in Molecular Medicine (Fall, 3 cr)	GPLS 716 Genomics and Bioinformatics (Spring, 3 cr) GPLS 718 Programming for Bioinformatics (Spring, 3 cr) GPLS 717 Genomic Applications (Fall, 3 cr) GPLS 728 Genomic Data Science (Fall, 3 cr)

2.) Elective Courses:

Students have maximum flexibility in selection of electives based on their interests, research needs and career goals. Elective credits may be used to fulfill course work required by Training Grants. In addition to the electives listed below, other Graduate School courses may qualify as electives, but are subject to approval, as they must be relevant coursework towards the PhD degree.

Spring Courses

GPLS 625 Ion Channels (2 cr)
GPLS 630 Fundamentals of Biostatistics (3 cr)
GPLS 645 Cell and Systems Physiology (3 cr)
GPLS 702 Basic Immunology (3 cr)
GPLS 709 Advanced Biochemistry (3 cr)
GPLS 710 Microbial Pathogenesis (3 cr)
GPLS 714 Muscle Contractility and Excitation (3 cr)[1]
GPLS 715 Muscle Cell Biology and Development (3 cr)[1]
GPLS 716 Genomics and Bioinformatics (3 cr)

GPLS 718 Programming for Bioinformatics (3 cr)
GPLS 721 Microscopy Fundamentals and Modern Imaging Applications (3 cr)
GPLS 790 Advanced Cancer Biology

Fall Courses
GPLS 616 Molecular Mechanisms of Signal Transduction (3 cr)
GPLS 623 Molecular Toxicology (3 cr)[1]
GPLS 642 Nociception of Pain (2 cr)
GPLS 665 Cancer Biology: From Basic Research to the Clinic (3 cr)
GPLS 701 Advanced Molecular Biology (3 cr)
GPLS 704 Principles of Virology (3 cr)
GPLS 717 Genomic Application (3 cr)
GPLS 725 Systems-Level Research in Microbial Pathogenesis (3 cr)
GPLS 728 Genomic Data Science (3 cr)
GPLS 737 Proseminar in Experimental Design (2 cr)
GPLS 750 Topics in Molecular Medicine (3 cr)
GPLS 769 Advances in Immunology (3 cr)

[1]Some courses are only offered every other year. [2]Course availability is subject to change.

Z. Training Grant Programs

NIH sponsored training programs provide excellent opportunities for the students to integrate into well-developed thematic programs. These training programs may also provide funds for travel to scientific meetings and student development. Faculty in the Molecular Medicine Program may be affiliated with the following NIH sponsored training programs. Interested students should discuss this option with their mentor and/or contact the Training Program Directors listed below. Updates and newly available training grant programs are listed at https://www.medschool.umaryland.edu/traininggrants/Training-Grants-at-UMSOM/.

Training Program	Granting Agency	Principal Investigator	Contact
Interdisciplinary Training in Cardiovascular Disease	NIH/NHLBI	**Dudley Strickland, PhD** Departments of Surgery and Physiology, Center for Vascular and Inflammatory Diseases **Rosemary A. Kozar, MD, PhD** Department of Surgery	dstrickland@som.umaryland.edu rkozar@umm.edu
Training Program in Integrative Membrane Biology	NIH/NIGMS	**Matthew Trudeau, PhD** Department of Physiology	mtrudeau@som.umaryland.edu
Interdisciplinary Training Program in Muscle Biology	NIH/NIAMS	**Aikaterini Kontrogianni-Konstantopoulos, PhD** Department of Biochemistry and Molecular Biology	akontrogianni@som.umaryland.edu
Research Training in Gastroenterology	NIH/NIDDK	**Jean-Pierre Raufman, MD** Department of Medicine	jraufman@medicine.umaryland.edu
Immunity and Infection	NIH/NIAID	**James Kaper, PhD** Department of Microbiology and Immunology	jkaper@umaryland.edu
Training Program in Cancer Biology	NIH/NCI	**Toni M. Antalis, PhD** Departments of Physiology and Surgery, CVID **Curt Civin, MD** Department of Medicine and Stem Cell Center	tantalis@som.umaryland.edu ccivin@som.umaryland.edu
Signaling Pathways of Innate Immunity	NIH/NIAID	**Stefanie Vogel, PhD** Department of Physiology and Department of Microbiology and Immunology	svogel@som.umaryland.edu
UMB Initiative for Maximizing Student Development (IMSD)	NIH/NIGMS	**Angela Wilks, PhD**	awilks@rx.umaryland.edu
Training Program in Diabetes and Its Metabolic Complications	NIH/NIDDK	**Simeon Taylor, MD, Ph.D** Department of Medicine	staylor2@medicine.umaryland.edu

Appendix 1: Timeline for PhD Program in Molecular Medicine

PhD Timeline	Step towards degree	Actions to be taken
First 3 semesters	**Coursework**	• Meet with Track Leader prior to semester registration deadline. • Complete *course* ***registration request form*** and ***GRA I progress report form***. • Submit completed forms to Academic Services Specialist to unlock registration. • Log in to SURFS and enroll in courses.
	Lab Rotations	• Attend Professor Rounds. • Meet with Track Leader and discuss potential lab rotation mentors. • Meet with potential lab rotation mentors. • Complete and submit ***lab rotation proposal form*** to Academic Services Specialist. • Participate and engage in lab rotation for 8-12 weeks. • Submit ***lab rotation completion form*** to Academic Services Specialist. • Register for GPLS 609 in the fall semester following completion of rotations,
Every fall semester	**Molecular Medicine Seminar**	• Attend required student seminar presentations. • Notify seminar instructor in advance if a seminar presentation will be missed.
Year 1, by the end of the summer semester	**Mentor/Lab Selection**	• Select a mentor/lab from 1 of the 3 completed rotations. • Confirm that mentor has time and funding to support dissertation research. • Inform Track Leader of your mentor choice. • Complete and submit ***track/mentor selection form*** to Academic Services Specialist. • Complete and submit ***mentor agreement form*** to Academic Services Specialist.
Year 2, by March 15th	**Qualifying Exam Part 1**	• Follow all instructions in Appendix 3 and submit written proposal to Track Leader. • If proposal is not accepted, revise and re-submit by assigned deadline. • If proposal is accepted, begin scheduling oral exam.
Year 2, by May 30th	**Qualifying Exam Part 2**	• Schedule and take oral exam. • Complete any necessary remedial actions by assigned date. • Re-take oral exam by date assigned, if necessary. • Ensure ***qualifying exam form*** is complete then submit to Academic Services Specialist. • Complete the ***advanced to candidacy application*** and submit to Graduate School.
3-6 months after passing Qualifying Exam	**Thesis Committee Selection & Approval**	• Discuss potential thesis committee members with mentor. *(Be sure to consult Molecular Medicine Guidelines for committee composition requirements.)* • Meet with Track Leader to go over potential committee members. • Ask desired committee members to serve, confirm availability and inform them about required committee meetings every 6 months. • Complete and submit ***thesis committee approval form***. • Schedule first meeting (many students find doodle plans are useful for scheduling committee meetings).
Within 6 months of committee approval and every 6 months until defense	**Committee Meetings**	• Organize, prepare and review *committee meeting record and individual development plan (IDP) form.* • Meet with committee, present research, discuss progress/concerns and set goals to be met by next meeting. • Complete and submit *post candidacy committee meeting record and IDP form.*
Within 12-15 months of passing Qualifying Exam	**Thesis Proposal**	• Organize research and prepare grant application according to Molecular Medicine Guidelines. • Schedule room and time to present proposal and inform Academic Services Specialist two weeks prior to presentation. • Complete and submit *thesis proposal form & IDP.* • Students are also strongly encouraged to revise and submit grant applications for pre-doctoral funding.
Year 3-5	**Molecular Medicine Seminar Presentation**	• Sign up in summer prior to fall of year 5 and winter prior to spring of year 3 and 4 • Become familiar with *peer review criteria.* • Prepare and present research in student seminar series.
3-6 months prior to Dissertation Defense	**Final Committee Meeting**	• Inform committee of progress and thesis content. • Obtain permission to write up and prepare final dissertation. • Complete and submit *committee meeting record and IDP form*.
Start of final semester	**Graduate School Forms**	• Follow all deadlines: Graduate School Deadlines
Final Semester	**Doctoral Dissertation Defense**	• Organize and prepare dissertation according to Graduate School requirements: Thesis and Dissertation Style Guide • Complete and submit ***pre-graduation checklist*** and ***alumni update form*** along with CV. • Submit ***Certification of Completion of the Doctoral Dissertation form*** signed by Readers to Program Director for signature. • Submit all required graduation paperwork: Graduate School Deadlines • Schedule room and time to defend. Be sure to inform Academic Services Specialist 2 weeks prior to defense.
After successfully defending	**Keep abreast of program activities and developments**	• Connect with us on LinkedIn: www.linkedin.com/in/umbmolecularmedicine.

Appendix 2. Timeline for MD/PhD Program in Molecular Medicine*

MD/ PhD Timeline	Step towards degree	Actions to be taken
Year 1, by the end of the summer semester	**Mentor/Lab Selection**	• Select a mentor/lab from 1 of the 2 completed rotations. • Confirm that mentor has time and funding to support dissertation research. • Inform Track Leader of your mentor choice. • Complete and submit ***mentor agreement form*** to Academic Services Specialist.
Every fall semester	**Molecular Medicine Seminar**	• Attend student seminar presentations. (Only 3 excused absences are allowed.) • Notify seminar instructor in advance if a seminar presentation will be missed.
Year 2, by July 16	**Qualifying Exam Part 1**	• Follow all instructions in Appendix 3 and submit written proposal to Track Leader. • If proposal is not accepted, revise and re-submit by assigned deadline. • If proposal is accepted, begin scheduling oral exam.
Year 2, by September 30th	**Qualifying Exam Part 2**	• Schedule and take oral exam. • Complete any necessary remedial actions by assigned date. • Re-take oral exam by date assigned, if necessary. • Ensure that ***qualifying exam form*** is complete and submit to Academic Services Specialist. • Complete the ***advance to candidacy application.*** Submit to Graduate School.
3 months after passing Qualifying Exam	**Thesis Committee Selection & Approval**	• Discuss potential thesis committee members with mentor. *(Be sure to consult Molecular Medicine Guidelines for committee composition requirements.)* • Meet with Track Leader to go over potential committee members. • Ask desired committee members to serve, confirm availability and inform them about required committee meetings every 6 months. • Complete and submit ***thesis committee approval form***. • Schedule first meeting- many students find Doodle plans are useful for scheduling committee meetings.
Within 6 months of committee approval and every 6 months until thesis defense	**Committee Meetings**	• Organize, prepare and review ***committee meeting record and individual development plan (IDP) form.*** • Meet with committee, present research, discuss progress/concerns and set goals to be met by next meeting. • Complete and submit ***committee meeting record and IDP form.***
Within 12-15 months of passing Qualifying Exam	**Thesis Proposal**	• Organize research and prepare grant application according to Molecular Medicine Guidelines. • Schedule room and time to present proposal and inform Academic Services Specialist two weeks prior to presentation. • Complete and submit ***thesis proposal form***. • Students are also strongly encouraged to revise and submit grant applications for pre-doctoral funding.
Year 2 and 3	**Molecular Medicine Seminar Presentation**	• Sign up in summer prior to fall of year 2 and winter prior to spring of year 3 • Become familiar with ***peer review criteria.*** • Prepare and present research in student seminar series.
3-6 months prior to Dissertation Defense	**Final Committee Meeting**	• Inform committee of progress and thesis content. • Obtain permission to write up and prepare final dissertation. • Complete and submit ***committee meeting record and IDP form***.
Start of final semester	**Graduate School Paperwork**	• Follow all deadlines: Graduate School Deadlines.
Final Semester	**Doctoral Dissertation Defense**	• Organize and prepare dissertation according to Graduate School requirements: Thesis and Dissertation Style Guide • Complete and submit ***pre-graduation checklist*** and ***alumni update form*** along with CV. • Submit ***Certification of Completion of the Doctoral Dissertation form*** signed by Readers to Program Director for signature. • Submit all required graduation paperwork: Graduate School Deadlines • Schedule room and time to defend. Be sure to inform Academic Services Specialist 2 weeks prior to defense.
After successfully defending	**Keep abreast of program activities and developments**	• Connect with us on LinkedIn: www.linkedin.com/in/umbmolecularmedicine.

**Note: the MSTP Program may have additional program specific requirements*

Appendix 3. Guidelines for Qualifying Examinations

The purpose of the qualifying examination is to test the student's readiness to make the transition from classroom training to thesis research. It consists of two parts: Part 1 is an original written research proposal in the format of an NRSA-style grant application. Part 2 is an oral examination in which students will be tested both on their foundation of knowledge in the field and their ability to orally defend their proposal.

Timing and Scheduling: Unless prior approval by the MMED Leadership is obtained, PhD students will take their Qualifying Examination in the spring semester of their second academic year, and no later than the end of their second year in the program. Ordinarily the Oral Exam part occurs in April or May of the second year. MD/PhD students will take their Qualifying exams before the end of their first academic year in the Program.

Examination Committee: A Qualifying Examination Committee for the student will be selected by the Track Leader and shall consist of five members of the GPILS Program faculty, plus the Dissertation Advisor (non-voting member). The Track Leader receives the proposal from the student, distributes it to the members of the Qualifying Examination Committee (and Program Director), and keeps the student informed of all subsequent decisions of the Committee. The student schedules the oral exam.

Review of the Research Proposal: The Qualifying Examination Committee will review the written proposal to determine whether it is satisfactory within two weeks of submission. If the written proposal is deemed defendable, the Track Leader will be notified by the examiners, and the student asked by the Track Leader to schedule an oral examination at the earliest convenient date. If the written proposal is deemed not satisfactory, it will be returned with examiner's comments for guidance in rewriting. The timing and number of resubmissions allowed for this process will be at the discretion of the Track Leader with consultation and advice from the Qualifying Examination Committee. A maximum of one month will be allowed for any revisions. Program Director will be kept informed and provided with copies of the written comments.

Oral Examination: The purpose of the oral examination is to test the student's foundation of knowledge and the student's abilities to defend any aspects of the written proposal, including the student's abilities to evaluate the literature relevant to the research topic, to formulate original and testable hypotheses, to select appropriate methods, to design well-controlled experiments, and to interpret experimental data. Students will not give a preliminary presentation in the oral exam. The purpose of the oral examination is not to grade the research proposal *per se*, but to determine readiness of the student to engage in thesis research.

Each examiner, in order, will ask a line of questions within two rounds of examination (*Note to examiners*: please refrain from trying to explain or restate another examiner's question; the student should do that if needed). Students will be expected to demonstrate knowledge of general topics in Molecular Medicine, and topics that derive from their academic coursework as well as their research proposal, whether or not they are asked about them directly. Questions may include justification of the choice of the proposal problem, the methods to be used, what given results might mean, what might go wrong, and alternative approaches. The student should be prepared to utilize a white/black board to illustrate concepts during the examination. The objective is to detect and probe areas of weakness; thus students should not expect to be able to answer all that they are asked. The oral exam is as much a test of ability to "think on one's feet" as of knowledge.

Students will be given ~10-15 minutes to answer the questions of a given examiner; the examiner may ask a second line of questions in the allotted time or pass to the next examiner. Other examiners may not answer any questions or provide substantive information to students during the examination. During the exam, the mentor/advisor is not allowed to ask questions or to comment. If a student is unable to answer a question to the examiner's satisfaction in that time period, the Chair will move on to the next examiner (who may choose to ask a related question or a question on a different subject). The exam will usually last 1-2 hours and is limited to **2.5 hours**. Thus, each examiner should be able to question the student at least twice during the exam.

At the end, the student will be asked to leave the room and the Qualifying Exam committee will discuss the exam with the mentor, who may act as an advocate for the student prior to the vote. In the absence of the student and the mentor, the Qualifying Exam committee will deliberate and decide the outcome by majority vote. The Qualifying Exam committee will determine whether (1) the student passes and is recommended for admission to candidacy, or (2) remedial actions are required. Remedial actions will include a defined written or oral remediation to make up deficiencies in knowledge as determined by the Qualifying Examination committee. The student and mentor will be informed of the committee's decision immediately after the examination. Any decision other than a pass will be accompanied with a written statement to the student and mentor within 48 hours outlining not only the reason for the decision, but also the requirements that should be met to achieve a pass. In the case of remedial actions, a second opportunity to pass the Qualifying Exam will be available. In the case of a minor perceived deficiency, the student will be asked to submit a written mini-review or other written report to correct the deficiency. Normally up to one month will be allowed to complete this assignment. In the case of a major deficiency or multiple perceived deficiencies, the student will be allowed one opportunity to retake the oral examination. The second oral examination will be conducted by the original Qualifying Examination Committee as soon as possible. Normally one month, up to a maximum of three months, will be allowed to prepare for a second oral exam. A failure of the Qualifying Examination shall be considered grounds for dismissal from the Program.

A Qualifying Examination Form should be completed during each stage of the process, appended with correspondence pertaining to any remedial actions, signatures obtained, and the original document(s) submitted to the Molecular Medicine Academic Services Specialist.

Instructions for the Written Research Proposal

1.) The research proposal must be an original work of the student. Students are permitted to seek advice and consult their advisor or other experts, but the proposal must be the student's own. The student will certify the proposal as his or her own work on the cover page.

2.) Read and follow the instructions carefully to avoid delays and misunderstandings. In preparing the application, avoid jargon; not all examiners will be familiar with your specific area of research. For terms not universally known, spell them out the first time it is used, with the appropriate abbreviation in parentheses; the abbreviation may be used thereafter. Define all terms. Remember that it is your job to make your proposal clear and comprehensible to the examiners. They should not be expected to do background preparation for the examination.

3.) The maximum length of the proposal is 7 pages, not including the Title Page or the Literature Cited. All tables, graphs, figures, diagrams, and charts must be included within the 7 page limit. Prepare the application single-sided and single spaced, staying within 0.5 inch margins. The print must be clear and legible. Use a standard font (Arial, Times, Courier, Helvetica) and a minimum size of 11 point.

4.) The proposal must contain the following sections:

A. Title, Abstract and Certification Page: The first page of the application is the title page with your name, affiliation and lab/mentor name. Please keep the title brief and to the point. The statement 'I certify that this is my original work' and your signature must be on the title page. The abstract should summarize the proposal in less than 350 words on the same page. (This page does not count towards the 7 page limit).

B. Specific Aims (1 page): An introductory paragraph should introduce the grant, followed by clearly stated the goals of the proposed research and a summary of the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved. State the hypotheses to be tested and/or the question that is to be answered clearly. List the specific aims and summarize your experimental approach for achieving each aim. **There should be no more than two Specific Aims**.

Tip: Top-notch research proposals are driven by strong hypotheses. Think of your hypothesis as the foundation

of your application -- the conceptual underpinning on which the entire structure rests. Generally, applications should ask questions that prove or disprove a hypothesis, challenge an existing paradigm, or address a critical barrier to progress in the field, rather than use a method to search for a problem or simply collect information.

C. Research Strategy (6-page limit): Organize the Research Strategy in the specified order using the instructions provided below. Start each section with the appropriate section heading—Significance, Innovation, Approach.

(a) Significance- Put the significance of your research in the context of 1) the state of your field and 2) the long-term research goals. You may want to address one or several of the following if appropriate:

- Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

Tip: This section will require a thorough knowledge of the relevant literature and the ability to critically evaluate existing knowledge to identify the relevant gaps, roadblocks and opportunities in the field. You should demonstrate familiarity with the field and knowledge about the research being done, referring to relevant scientific literature. If you leave out an important work, reviewers will assume you are not aware of it. State concisely the importance and biomedical/health relevance of the research by relating the specific aims to the broad, long-term objectives. Why is the work important? What has already been done? How is it significant?

(b) Innovation – Explain how the work is new and unique and how it will add significantly to what's known. You may want to address one or several of the following if appropriate:

- Explain how the application challenges and seeks to shift current research or clinical practice paradigms. If your proposal challenges an existing paradigm, you'll need to build a strong case for your ability to challenge the existing paradigm and your reason for doing so.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, approaches or methodologies, technologies, treatments, services, or interventions that drive this field will be changed if the proposed aims are achieved.

(c) Approach – For each Specific Aim of the project, describe the overall strategy, methodology, and analyses to be used to accomplish the aim.

- Under strategy explain what you want to do and why. This section may include data only if you want to and have data to include. Data is not required; examiners are aware that you have only been in the laboratory a short time. If you do include data, keep in mind that the primary purpose of this section is to provide experimental support for the hypotheses to be tested and to demonstrate the technical feasibility of the project.
- Under methodology explain how you are going to do the proposed work. Include sufficient information for a full evaluation of the project, independent of other documents. Be specific and informative, and avoid redundancies. Be sure to mention, where appropriate, which statistical methods you plan to use.
- Under expected results, discuss what results you anticipate and what your interpretations will be if you do or do not obtain those results. (See Hints, below).
- Under possible pitfalls and alternate methods, discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.

D. Literature Cited (no page limit): List all references that are relevant to your proposed work. Each reference must include the title, names of authors, book or journal, year of publication, volume number, and page numbers. Use this opportunity to gain experience using reference database software such as *Reference Manager* or *Endnote*. In addition, highlight the 5 references that are most central to your proposal. These should be the papers that form the theoretical and methodological foundation upon which your proposal rests (choose carefully: your ability to identify these papers will in part indicate your understanding of the field). Examiners may test your understanding of these papers, both their strengths and weaknesses, as part of the exam.

Hints: The following is an abbreviated checklist from the NIH for suggestions about the Research Design and Methodology.

General

Does each experiment correspond to one of the specific aims, and are they stated in the same order?
Do the experiments follow a logical sequence?
Did I use flow charts and decision trees to show paths of experiments and how they will progress?
Have I included sufficient detail to show I understand and can handle the research?
Have I only included information that is needed to state my case, i.e., have I avoided including anything I don't plan to do?
Have I cited references wherever possible?

Approach

Did I state the expected outcome of my research?
Did I list each set of experiments in the same order as my specific aims, linking my experiments to the aims?
Are the methods I chose appropriate to achieve the specific aims?
Did I show why each experiment is important or how it is relevant to the hypothesis?
Are the experiments in a logical sequence, flowing from one to another with clear end points?
Will reviewers think I am knowledgeable about my methods?
Did I justify my choice of methods in detail?
Did I outline my methods in detail?
Did I support my methods with data/references?
Did I provide solutions for potential problems?
Is my proposed model system appropriate?
Did I address difficulties I may encounter with the proposed approaches, show I can handle them, and propose solutions and alternatives?
Did I consider how the limitations of the approaches may affect my results and data?
Did I address possible problems and limitations of the procedures, and propose solutions?
Did I estimate how much I expect to accomplish each year of the grant and state any potential delays?
Did I use enough detail?
Did I include all relevant controls?
Did I anticipate reviewers' questions about the feasibility of what I propose, e.g., how I will gain access to reagents, equipment, or study populations?

Results

Did I show I am aware of the limits to and value of the kinds of results I expect?
Have I convinced the reviewers that I will be able to interpret my results?
Are statistical methods used appropriately?
Did I define the criteria for evaluating the success or failure of a specific test?
Did I state the conditions under which my experimental data would support or contradict my hypothesis?
Did I state the limits I will observe in interpreting results?

Student name: Current GPA:
Research Track:

MOLECULAR MEDICINE PROGRAM

Qualifying Examination Form

Mentor name:
Primary appointment department:
Graduate Faculty status:

I. Grant Writing Component **Date submitted to track leader:**

The written proposal must be an original, satisfactorily written research proposal in the form of a NRSA grant application as per Molecular Medicine Program guidelines. (If the first written proposal was not satisfactory, the student was provided with written guidance (comments attached) and allowed a maximum of one month to revise).

☐ **Satisfactory proposal. Schedule oral exam.**
☐ **Revision required and must be submitted by the following date**:
☐ **Revised proposal deemed satisfactory. Schedule oral exam.**
☐ **Revised proposal deemed unsatisfactory. See program director.**

Track Leader signature:_____ Date: _____

II. Oral Component Date of exam:

☐ **Pass**

☐ **Minor deficiency** in one aspect of knowledge, hypothesis testing or other. Remedial action required by the following date: (Details regarding form of remedial action to be taken must be attached).

☐ **Retake** oral comprehensive exam by the following date:
(Reason for this decision and outline of requirements to be met must be attached. Exam must be re-taken within 1-3 months.)

III. Remedial Exam Date of exam:

☐ Pass ☐ Fail

Examination Committee Members

Member names	Member signatures
Chair:	
Member 1:	
Member 2:	
Member 3:	
Member 4:	
Mentor:	

Track Leader signature:_____ Date:_____
Program Director signature: _____ Date: _____
University of Maryland Graduate School, Baltimore

Application for Admission to PhD Candidacy

- Read the requirements for the Doctor of Philosophy degree in the Graduate School catalog
- Familiarize yourself with the specific PhD requirements established by your program
- Complete this application

- Obtain approval signatures from your primary adviser and graduate program director
- Attach your unofficial transcript printed from SURFS to this application; cross out courses that will not count toward this PhD degree
- Submit this application and transcript to: gradforms@umaryland.edu or Graduate School Dean's Office, 620. W. Lexington St.,

Last Name:	Title First Name ☐Mr. ☐Ms. ☐No Title
Student ID Number: @	E-mail address:
Mailing Address: Street City State ZIP	
Graduate Program:	Date admitted to Graduate Program:
Number of credits earned toward this PhD Degree (not including 899):	List course(s) in which a incomplete (I) or no mark (NM) was earned:
List course(s) earned at other institutions which will count towards this PhD degree (grade earned must be ≥B, attach official transcript):	

APPROVAL SIGNATURES **Please** type and sign		
Adviser:	**Signature:** Graduate Faculty Status: **Regular☐Associate ☐ Special ☐**	**Date:**
Graduate Program Director:	**Signature:**	**Date:**
Graduate School Associate Dean: **Dr. Erin Golembewski**	Submit application to Graduate School Dean's Office for **Signature:**	**Date:**

Appendix 4: Guidelines for Molecular Medicine Seminar Presentation

An oral presentation is one of the two primary means by which scientific knowledge is communicated, with the other being the publication of scientific manuscripts. Oral presentations are generally also a major component of job interviews. Beginning in the third academic year, students will prepare and deliver a yearly formal seminar for presentation to the program. The seminar should tell a story that incorporates the basis for the thesis research and the progress they have made on the project. The seminar should not be a reiteration of your specific aims as in the Thesis Proposal. For third- and fourth-year students, it will not be a complete story. However, as students move closer to completing their thesis work and preparing for its defense, the story should be more complete. Students

should present an appropriate introduction leading to the specific problem to be addressed, a hypothesis, data with explanation of how it supports the hypothesis, and the impact of the work on the field of study. The length of the presentation will reflect the year of study as outlined below.

Expectations

- During the summer between the 2nd and 3rd academic years (i.e. after the qualifying exam), students will enroll in and complete the 6-8 week American Society for Biochemistry and Molecular Biology Art of Science Communication course to develop basic skills in science presentation.
- 3rd and 4th year PhD students/2nd and 3rd year MD-PhD students are expected to deliver a 25-30 minute seminar, followed by questions.
- Students in the 5th year or beyond will be expected to deliver a 40-45 minute seminar, followed by questions.
- Students will only be excused from delivering a yearly seminar by request if the thesis defense will be scheduled within the same academic year. Requests to be excused must be sent by the faculty mentor to the course director and program director.

Suggested structure for Molecular Medicine Seminar presentation:

Introduction

- Brief introduction about the field of research and its importance
- Identify the important question(s) in the field – that you sought to address
- Derive a hypothesis that you will test based on previous studies in the field and that address one of the important questions you described.

Presentation of data

- Be sure to describe how you did your experiment, but keep the presentation of methods brief, limited and to the point. Describe what you found (result), and what you can infer from the result.
- Summarize how your data supports or refutes your hypothesis
- You may have to do this several times throughout the talk to bring different data sets together to show how they work together to build a model.

Summary

- You may want to present a model to summarize the data or several smaller models as you go through your data and then a final model that brings the talk together.
- Briefly outline your plans for future work or outstanding questions still to be addressed

Acknowledgments

- Acknowledge the funding for the work and thank collaborators.

General Advice:

- As you attend seminars outside of your field across campus, note how the seminar is structured. Especially take note of seminars that are well presented.
- Several days prior to giving the seminar, enlist your mentor and colleagues to review the seminar.
- Less can be more. Do not race through your slides to make a 90 min talk into a 40 min talk. Instead, cut or summarize where possible. A good rule of thumb is 45 seconds to 1 minute per slide.
- If you are not going to explain something that appears on the slide, delete that part of the slide.

Assessment:

Seminars are assessed by a Molecular Medicine Peer Review Panel and the Faculty Director immediately after the seminar. Criteria for assessment include the clarity and appropriateness of the abstract and title, the clarity of the presentation in terms of background/Introduction, data presentation, summarization of findings, whether the data supports the conclusions/models. In addition, the quality of the slides in terms of readability, labeling, colors, etc.; and the presenters speaking style are evaluated. Suggestions for improvement of the seminar are discussed with the speaker.

Appendix 5: GPILS Policy on Final Core Course Grades (updated December 14, 2016)

1. GPILS PhD students enrolled in the “Core Course” (Mechanisms in Biomedical Sciences: From Genes

to Disease, GPLS 601) are expected to earn a final grade of B (3.0) or greater.

2. Students that earn a B- in GPLS 601 will immediately be placed on academic probation regardless of cumulative grade point average (GPA). In accordance with UMB Graduate School policy (http://www.graduate.umaryland.edu/Policies), students will need to achieve a spring term GPA of B (3.0) or better. Not doing so will lead to dismissal from GPILS including any Graduate Assistantship support such as stipend, health insurance, and tuition remission. Graduate Assistant stipends will continue for two weeks after dismissal, health insurance will continue until the end of the policy term.

3. Students that earn a grade of C+ or lower in GPLS 601 will be dismissed from the Program regardless of cumulative GPA. Graduate Assistant stipends will continue for two weeks after dismissal, health insurance will continue until the end of the policy term.
    a. In accordance with UMB Graduate School policy (http://www.graduate.umaryland.edu/Policies), a dismissed student may appeal the academic dismissal. A written Appeal must be submitted to the Graduate School and to the student's Program Director by January 2 following the Fall term or June 2 following the Spring term. The appeal will be presented by the student's Program Director to a GPILS Appeals Committee consisting of three GPILS faculty members, the Associate Dean for Graduate and Postdoctoral Education, and the Course Master for the "Core Course."
    b. The review of the Appeal will either result in:
        - Denial of the appeal; the dismissal is upheld.
          The dismissed student may apply as a non-degree seeking student to retake the "Core Course" the next fall at her or his own expense. If the student earns a final letter grade of grade of B (3.0) or greater in the retake of GPLS 601, she or he may reapply to GPILS. There is no guarantee of re-admission.
        - Acceptance of the appeal; the dismissal is overturned.
          The student will be reinstated into the Program on academic probation. During the probationary time period, the student must:
            - Achieve a grade of B (3.0) or better in each course taken in the subsequent, Spring semester. Not doing so will lead to dismissal from GPILS regardless of cumulative GPA, and loss of all Graduate Assistant support.
            - Retake the "Core Course" the following Fall semester and earn a final grade of B (3.0) or better. Failure to earn a final grade of B (3.0) or better in the retake of GPLS 601 will result in dismissal from GPILS regardless of cumulative GPA.

Appendix 6: Additional information and forms available online at https://lifesciences.umaryland.edu/moleculermedicine/Faculty--Staff-Resources/

Appendix 7: Signature Page

(Please read and sign a copy of the Student Handbook Acknowledgement below. Provide the original signed version to the Academic Services Specialist.)

655 W. Baltimore Street
Bressler Research Building,
Room 1-005 Baltimore, MD 21201
410-706-5422
fax http://lifesciences.umaryland.edu

UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

GRADUATE PROGRAM IN LIFE SCIENCES

University of Maryland School of Medicine
Graduate Program in Life Sciences

Student Handbook Acknowledgement

I have received, reviewed and sought clarification of the Student Handbook and its contents. I am aware and responsible for adhering to all policies and procedures contained in this student handbook.

•I acknowledge that I am accountable for the standards set forth in the Student Handbook.
•I agree to follow all policies and procedures contained in the student Code of Conduct.

I understand the **Program in Molecular Medicine** policies are subject to revision throughout my student career and I am responsible for remaining current. I am aware that this acknowledgement letter will be saved in my student file.

_____
Student Name (Printed)

_____ _____
Student Signature Date

_____ _____
Program Rep. Initials Date