Program in Molecular Medicine

Student and Faculty Handbook
2015–2016

UNIVERSITY OF MARYLAND GRADUATE SCHOOL
UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE

Graduate Program in Life Sciences
Program in Molecular Medicine
800 W. Baltimore Street, Room 216 Baltimore,
MD 21201
Phone:410-706-8114 Fax:
410-706-8121
http://molecularmedicine.umaryland.edu/

Program Director: Toni M. Antalis, Ph.D.
Program Manager: Marcina Garner  (mgarner@som.umaryland.edu)

Version 10/20/2015
Table of Contents

A Message from the Director and Track Leaders ................................................................. 3

The Ph.D. Program in Molecular Medicine

A. Outline of Study ............................................................................................................... 4
B. Registration and Advisement ......................................................................................... 5
C. Doctoral Student Funding ............................................................................................. 6
D. Tuition Remission and Payment by Grant Forms ....................................................... 6
E. Coursework .................................................................................................................... 7
F. Laboratory Rotations .................................................................................................... 7
G. Student Seminars ......................................................................................................... 9
H. Choosing a Track and a Mentor .................................................................................. 9
I. Individual Development Plan (IDP) .............................................................................. 10
J. Qualifying Exam and Admission to Candidacy ........................................................... 11
K. Thesis Advisory Committee ....................................................................................... 12
L. Thesis Advisory Committee Meetings ........................................................................ 13
M. Thesis Proposal .......................................................................................................... 13
N. Preparation for the Doctoral Dissertation ................................................................. 14
O. Doctoral Dissertation .................................................................................................. 15
P. Transfers into the Molecular Medicine Program ...................................................... 15
Q. Application Requirements for UM Masters Students ............................................... 16
R. M.D./Ph.D. and M.D. Fellows Program ...................................................................... 16
S. Student Academic Misconduct .................................................................................. 16
T. Responsibilities as a Graduate Research Assistant ..................................................... 16
U. Student Stipends, Fees, Tuition and Benefits ............................................................. 17
V. Graduate Student Association ..................................................................................... 17
W. Professional Development Opportunities for Graduate Students ............................. 17

Track Curriculum Plans of Study

X. Molecular Medicine Curriculum .................................................................................. 18

Training Grant Programs ............................................................................................... 20

Appendices
Appendix 1: Timeline for Ph.D. Program in Molecular Medicine ................................. 21
Appendix 2: Timeline for M.D./Ph.D. Program in Molecular Medicine .......................... 22
Appendix 3: Guidelines for Qualifying Examinations ...................................................... 23
Appendix 4: Guidelines for Molecular Medicine Seminar Program .............................. 28
Appendix 5: Forms Available Online ............................................................................ 29
Appendix 6: Signature page ............................................................................................ 30

Molecular Medicine Student Resources: http://lifesciences.umd.edu/molecularmedicine/student.aspx
Graduate Program Forms and Procedures: http://www.graduate.umd.edu/Forms/
Student Academic Misconduct Policy: http://www.graduate.umd.edu/policies/
GRA Handbook http://www.graduate.umd.edu/Costs-and-Aid/Graduate-Assistantships/
A Message from the Director and Track Leaders

We would like to take this opportunity to welcome you to the Ph.D. 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 Ph.D. 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/policies/ and http://lifesciences.umaryland.edu/. Additional programspecific 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.

Molecular Medicine Ph.D. Program

Governing Committee on Graduate Studies (COGS) for 2014–2015

Program Director Toni M. Antalis, Ph.D.
Professor, Physiology and Surgery
(410) 706-8222
tantalis@som.umaryland.edu

Track Leaders

Scott Devine, Ph.D.
Genome Biology Track
Associate Professor, Medicine
(410) 706-2343
sdevine@som.umaryland.edu

Terez Shea-Donohue, Ph.D.
Molecular Physiology and Pharmacology Track
Professor, Medicine and Physiology
(410) 706-5503
tdonohue@mbrc.umaryland.edu

Jeff Winkles, Ph.D.
Cancer Biology Track
Professor, Surgery and Physiology
(410) 706-8172
jwinkles@som.umaryland.edu

Program Manager
Marcina Garner
The Molecular Medicine Ph.D. Program (MMED)

The Graduate Program in Molecular Medicine at the University of Maryland is an inter-disciplinary program of study leading to a Ph.D. degree. This program combines traditional areas of biomedical study, including Molecular Genetics, Genomics and Bioinformatics, Molecular and Cell Biology, Pathology, Pharmacology 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 150 biomedical researchers who investigate a wide range of biological questions with relevance to human health. The Program has three different tracks: Molecular Physiology and Pharmacology, Cancer Biology, and Genome Biology, each with tailored curricula of study.

For more information on the program and each track refer to [http://molecularmedicine.umd.edu](http://molecularmedicine.umd.edu).

For useful student resources, refer to [http://lifesciences.umd.edu/molecularmedicine/student.aspx](http://lifesciences.umd.edu/molecularmedicine/student.aspx)

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. By 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 Molecular Medicine 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). M.D./Ph.D. students enter the program as second year students and follow a similar program (refer to Appendix 2 and Section Q for M.D./Ph.D. and MD fellows program requirements). Throughout the program, students are expected to attend and participate in a variety of weekly seminars and workshops.

The Molecular Medicine Ph.D. tracks follow 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 Ph.D. 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
website on Academic Performance and Progress in Ph.D. Programs at http://www.graduate.umaryland.edu/policies/

B. Registration and Advisement

Course registration for the first semester will be handled by the Program Manager, Marcina Garner. Ms. Garner will contact students 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 (http://www.graduate.umaryland.edu/Forms/) to indicate their approval of the desired course work. At this time Student Progress Form GRA I or Student Progress Form GRA II will be completed.
- Student registration is locked by default. 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 Program Manager. Registration will then be unlocked.
- Finally, students must log on to the SURFS website (https://www.simsweb.umaryland.edu/pls/SIMS/twbkwbis.P_WWWLogin) to complete the registration process at least 6 weeks before the start of the semester. Instructions detailing this process will be emailed to university accounts. Please note that if there is an outstanding balance on a student’s account, he or she will not be able to register.

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 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 (see Section I). Regular meetings with the Thesis Advisory Committee at 6 monthly intervals are required and must be documented (see Sections J). The purpose of these meetings is 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, to seek the Thesis Advisory Committee’s advice on the experimental plan and on the student’s IDP plan, and 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 research credits.

C. Doctoral Student Funding
Students accepted into the Molecular Medicine Ph.D. 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.

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 laboratory in which to pursue dissertation work. After 18 months, students on GRA support must 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. Thus, by no later than March 1st of the second year, all students should have secured funding source for their dissertation research and should be working actively to develop their dissertation research projects.

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.

As stated in the Graduate Assistant Policies and Guidelines (http://www.graduate.umaryland.edu/policies/), students are not formally eligible for vacation or sick leave. However, mentors may have their own policies which can allow such flexibility. The granting of these benefits is at the discretion of the mentor.

Regardless of funding source, during lab rotations and later when working on dissertation projects, students are expected to devote 100% of their time and effort not spent on coursework into their research. In most cases, all the work that students do in their rotations is directly related to their dissertation and academic development. However, in some cases, a GRA-funded student is assigned up to 20 hours per week of work by the rotation or dissertation mentor that is not necessarily related to his or her progression toward a degree. For further information about Graduate School policies, see the Graduate Assistant Guide under Financial Support forms at (http://www.graduate.umaryland.edu/Forms/).

D. Tuition Remission and Payment by Grant Forms
During the first 18 months, graduate student assistants are responsible for completing and submitting tuition remission forms (https://www.umaryland.edu/hrs/benefits/educational-benefits/tuition-remission/) to the Graduate School each fall and spring semester. Copies of completed forms must be submitted to the academic coordinator at least 6 weeks before the start of the semester. It is important that these forms be submitted on time. Late forms result in account holds and registration problems.

Once a student transitions to being funded by a mentor, they must have the mentor’s administrator complete the tuition remission form with an account code in box 17, and then have the mentor or the mentor’s administrator sign off on the form. Tuition remission forms must be completed each fall and spring semester. Completed forms must be submitted to Human Resources (620 W. Lexington St., 3rd Floor) at least 6 weeks before the start of the semester for which tuition remission is requested. In addition, a payment by grant form (http://www.fincsvc.umaryland.edu/images/tuition-payment-PS.pdf) must be completed in order for the student to receive health insurance coverage. Please note that students must register for classes to generate a bill before completing the payment by grant form because the form requires an insurance amount from the student’s bill. These forms must be completed and submitted to Student Accounting (601 W. Lombard St., 2nd Floor) at least 4 weeks before the start of the semester.
Graduate research assistants must register as full-time students to remain eligible for stipend, tuition remission, and health insurance benefits each semester that they hold an assistantship. Tuition is remitted for 20 credits combined for fall and spring semesters. All students who receive a GRA must also register for 7 credits of ABGA 900 in each of the fall, spring, and summer semesters. These credits do not count against the 10 credits for which tuition will be remitted. Tuition for the summer semester is not covered according to the Graduate School’s policy. All other fees and auxiliary benefits (i.e. dental, vision, etc.) are the responsibility of the graduate student. Payment of these fees may be covered by the mentor once a student has chosen a lab. For further information on health insurance, fees and student accounting questions, visit http://www.fincsvc.umaryland.edu/sa/

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. Molecular Medicine 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. In addition to the GPILS Core Course, Molecular Medicine students are required to take a 1 credit course that may be met with GPLS 690, 691, 692 or 644 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 S of this document). All MMED Ph.D. 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 and is met by CIPP 907 Research Ethics (noncredit/certificate of completion issued). Students should contact the Program Manager to sign up for CIPP 907 prior to the fall of the second year of study in the PhD Program. Students are also required to register for 2 separate credits of GPLS 608: Molecular Medicine Seminar, one upon completion of their Thesis Proposal and the second upon completion of their Molecular Medicine seminar. See Section G 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 Ph.D. 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. The first laboratory rotation should be arranged to begin in early December at the end of the Core Course, the second lab rotation should begin in February and the third lab rotation should begin by May. 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.

Choosing 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 Program Manager 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 Molecular Medicine Program organizes “Professors’ Rounds” consisting of informal ~20 minute talks by program faculty. The Molecular Medicine 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 Molecular Medicine Seminar Series each fall 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 (Appendix 5) 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 Program Manager. At the end of each rotation, the student submits an additional form to the Track Leader for approval. This form (Appendix 5) 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 Program Manager must also receive a copy of the approved lab rotation completion form for the student’s file. 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 Program Manager.
G. Student Seminars
All Molecular Medicine Students are required to attend the student-run Molecular Medicine Seminar Series throughout the course of their Ph.D. 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. No more than three excused absences are allowed. In addition, depending on research interests, students are encouraged to attend the Membrane Biology Seminar series held in the spring semester each year, in addition to Departmental Seminars, Journal Clubs and various other Interest Group meetings.

Student Seminar Presentations: The ability to effectively communicate and present research findings to the scientific community is an important skill to develop during the course of graduate study. Students are required to register for 2 separate credits of GPLS 608: Molecular Medicine Seminar, after fulfilling the requirements for 2 formal seminar presentations (1 credit each) in publicly advertised forums. The first of these requirements is met by the public seminar presented as part of the Thesis Proposal and the second requirement is met by signing up and presenting a seminar in the Molecular Medicine student-run seminar series, held in the fall semester:

Thesis Proposal Seminar- 1 credit (see also Section L): 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 Program Manager 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 Program Manager 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- 1 credit: 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. Students will be graded (Pass/Fail) by the Seminar Faculty Program Director on the quality and clarity of their presentations.

H. Choosing a Track and a Mentor
First year students will 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 S) 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 (see Section S) 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. 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 Molecular Medicine Mentor Agreement (Appendix 5), which will then be submitted to the Program Manager.

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: http://www.graduate.umaryland.edu/About/Faculty-and-Staff/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 V) 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 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. 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 (Appendix 5). 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 shortterm 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 ensure that these discussions take place.

J. Qualifying Exam and Admission to Candidacy

In order for a student to be admitted to candidacy, several conditions must be met:

1. Complete program/track course requirements with a minimum 3.0 grade point average.
2. Prepare a defensible NIH-NRSA style research proposal (science portion only), up to 7 single spaced pages plus reference citations.
4. Complete any other track-specific requirements.

These conditions are expected to be met by April/May (no later than May 30th) of the second year for Ph.D. students and before the end of the first year (no later than September 30th) for M.D./Ph.D. 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. If the Qualifying Examination Committee judges the written proposal satisfactory, an oral exam will be scheduled.

2. Comprehensive Oral Exam
   The student will not give a preliminary presentation. 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 5), including all signatures, should be submitted to the Program Manager. 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 Program Manager 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 names of the members of the Thesis Advisory Committee must be submitted to and approved by the Track Leader and Program Director within 3 to 5 months of passing the Qualifying Exam and well before the Thesis Proposal. This purpose of this committee is to provide support in the individual faculty areas of expertise while guiding and encouraging the student’s design and execution of an original, high-quality, doctoral-level research project. The committee is also charged with providing advice relating to IDPs and career planning.

The student and mentor should discuss potential Thesis Advisory Committee members and obtain the Track Leader’s approval prior to finalizing the committee membership. While the Thesis Advisory Committee may consist of 5-7 faculty members, including the mentor, the Molecular Medicine Program requires that the Thesis Advisory Committee consist of at least 6 members, including the mentor. The program’s additional requirement is that at least 3 members, including the mentor, be faculty members in the Molecular Medicine Program. An external member of the Thesis Advisory Committee is required and must be selected from outside of the Molecular Medicine Program, and preferably external to the School of Medicine or to the University itself. Members should be chosen primarily on the basis of their knowledge of an aspect of the thesis and their ability to render helpful advice. There should be diverse faculty representation from different Departments within the School of Medicine. After each meeting, the Thesis Advisory Committee Approval Form and the accompanying IDP ([http://lifesciences.umaryland.edu/molecularmedicine/student.aspx](http://lifesciences.umaryland.edu/molecularmedicine/student.aspx)) should be completed, signed by all Committee members and approved by the Track Leader and Program Manager.

The Thesis Advisory Committee will constitute the final Doctoral Dissertation Committee. The names of the members of this committee must be submitted to and approved by the Graduate School at least 6 months prior to the final thesis defense. The required ‘Nomination of Members of Final doctoral Examination Committee’ form can be found at: [http://www.graduate.umaryland.edu/Forms/](http://www.graduate.umaryland.edu/Forms/). Any changes made to the original composition of the Thesis Advisory Committee must be submitted on a Thesis Advisory Committee change form (Appendix 5) and approved by the Track Leader and Program Director, prior to submitting changes to the Graduate School. The approved committee change form plus any accompanying documentation must be provided to the Program Manager to place in the student files.

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. 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. Significant delays in holding Thesis Advisory Committee meetings can result in a hold on the student’s registration.

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) form (Appendix 5), 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 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 (Appendix 5) to indicate their approval.

M. Thesis Proposal

Within 12-18 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 R01 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 describe what is left to complete). Thus, it is the intent that the content of the Thesis Proposal stand 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, receive feedback and potentially be awarded funding for the duration of the research project.

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 R01 (http://grants.nih.gov/grants/funding/r01.htm) or F31 (https://researchtraining.nih.gov/programs/fellowships) application, typically 7-12 pages, excluding references. 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 Program Manager 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 (Appendix 5), 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. 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 Molecular Medicine Program requires a minimum of 1 first author peer-reviewed, original research publication as an outcome of the student’s Dissertation research, and 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 (Appendix 5).

O. 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.

Once the student is preparing to write their thesis, they should consult the Graduate School website (http://www.graduate.umaryland.edu/Forms/) for the current forms and deadlines for graduation. For clarification on any of the information provided students should 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: (http://www.graduate.umaryland.edu/Forms/). 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. Publication of findings in peer reviewed journals prior 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. The Certification of Completion of the Doctoral Dissertation form, completed and signed by the readers, is provided to the Program Director along with the student’s CV for certification of completion of all molecular Medicine program requirements, and then must be submitted to the Graduate School at least 2 weeks prior to the proposed examination date.

The Dissertation Defense will consist of a public seminar, announced campus-wide, and will be followed by a private meeting of the candidate with the Doctoral Dissertation Committee (composed of the members of the Thesis Advisory Committee). At this meeting, committee members may discuss with the candidate 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 defense is not acceptable, the candidate will be given one more opportunity to pass.

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

Q. Application Requirements for University of Maryland Graduate School Master’s Degree Students
The Molecular Medicine Master’s Program at the University of Maryland is independent from the Molecular Medicine Ph.D. Program. Students in the Molecular Medicine Master’s Program who wish to be considered for admission to the Molecular Medicine Ph.D. Program must apply for consideration along with the regular applicant pool by the January deadline. Masters 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 the Master’s program will not be considered for admission.

R. M.D./Ph.D. and M.D. Fellows Program Requirements
M.D./Ph.D. students and M.D. Fellows enter the graduate program essentially as second year graduate students. M.D./Ph.D. 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 Molecular Medicine Program Director. M.D. Fellows may be excluded from the rotation requirement. Since M.D./Ph.D. students and M.D. 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 M.D. fellows who enter the Molecular Medicine Ph.D. Program may be approved by the MMED COGS and the Molecular Medicine Program Director. Credit may be given for courses which overlap with medical courses at the discretion of MMED COGS (refer to the timeline in Appendix 2). M.D./Ph.D. 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.

S. Student Academic Misconduct
Students pursuing a Ph.D. 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.

T. 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 18 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. Policies and Procedures for Graduate Student Assistantships (http://cf.umd.edu/umpolicies/usmpolicyInfo.cfm?polid=118) and the Graduate School’s Graduate Assistant Handbook (http://www.graduate.umaryland.edu/Costs-andAid/Graduate-Assistantships/) are not eligible for formal vacation or sick leave. However, 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% effort after the completion of their coursework to their studies and research, and may not be employed in any other capacity.

U. 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:

<table>
<thead>
<tr>
<th>Level</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>$28,000</td>
</tr>
</tbody>
</table>
Level II $29,000 (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. Tuition is remitted 10 credits per Spring and Fall semester. Summer and Winter semesters are not covered as per the Graduate School’s policy. All other fees and auxiliary benefits are the responsibility of the graduate student.

V. 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 http://graduate.umaryland.edu/gsa/. If you are interested in becoming an active member or representative in the GSA, please email them at gsa@umaryland.edu for further information.

W. Professional Career Development Opportunities for Graduate Students
Students are encouraged to participate professional development activities. The Molecular Medicine Program seeks volunteers to represent the Molecular Medicine 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 Marcina Garner, Program Manager for more information and to express your interest.

The Office of Postdoctoral Scholars (OPS) offers a variety of training experiences and career development opportunities to enrich the long-range outcomes of student 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 http://medschool.umaryland.edu/postdoc/career.asp and http://medschool.umaryland.edu/postdoc/ and/or contact Jennifer Aumiller, Director of Career Development for Pre and Postdoctoral trainees (jaumiller@som.umaryland.edu).

X. Molecular Medicine Curriculum

Requirements for all Molecular Medicine Ph.D. Students
GPLS 601 Mechanisms in Biomedical Sciences - GPLS Core Course (Fall, 8 cr) One of the following courses:
- GPLS 690 Current Topics in Vascular and Stem Cell Biology (Fall, 1 cr)
- GPLS 692 Current Topics in Genome Biology (Fall, 1 cr)
- GPLS 691 Molecular Neuroscience Biophys (Fall, 1 cr)
- GPLS 644 Intro Membrane Biophysics (Fall/Winter, 1 cr)
CIPP 907 Research Ethics (meets monthly Aug-May) - No credit, Certificate course GPLS 647 Molecular Medicine Survival Skills (Fall, 2 cr)

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

Seminar Credits (2 seminar credits must be earned before graduation):
GPLS 608 Seminar Mol Med (Sec 02, 1 cr, P/F)
Students register for seminar credit in the semester after they present at the Molecular Medicine Seminar Series
Students register for seminar credit in the semester after they defend their Thesis Proposal.

**Additional Requirements by Track**

Students are expected to enroll for 6-8 academic credits/semester, totaling at least 12 academic credits at the time of the Qualifying Exam.

**(1) Required Courses:**

<table>
<thead>
<tr>
<th>Cancer Biology</th>
<th>Molecular Physiology and Pharmacology</th>
<th>Genome Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPLS 790 Advanced Cancer Biology</td>
<td><strong>Physiology:</strong> GPLS 645 Cell and Systems Physiology (Spring, 3 cr)</td>
<td>GPLS 716 Genomics and Bioinformatics (Spring, 3cr)</td>
</tr>
<tr>
<td>(Spring, 3 cr)</td>
<td>GPLS 750 Topics in Molecular Medicine (Fall, 2 cr)</td>
<td>GPLS 718 Programming for Bioinformatics (Spring, 2 cr)</td>
</tr>
<tr>
<td>GPLS 665 Cancer Biology: From Basic</td>
<td><strong>Pharmacology:</strong> GPLS 607 Fundamentals of Pharmacology</td>
<td>GPLS 717 Genomics of Model Species and Humans (Fall, 3 cr)</td>
</tr>
<tr>
<td>Research to the Clinic (Fall, 3 cr)</td>
<td>(Spring, 2 cr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GPLS 624 Oncopharmacology (Spring, 3 cr) or GPLS 604 Neuropharmacology (Fall, 3 cr)</td>
<td></td>
</tr>
</tbody>
</table>

**(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 Institutional Training Grants.

**Elective Courses for all Tracks¹:**

*Spring*
- GPLS 607 Principles of Pharmacology (2 cr)
- GPLS 624 Molecular Oncopharmacology (3 cr)
- GPLS 625 Ion Channels (2 cr)
- GPLS 626 Membrane Carriers and Transporters (2 cr)
- GPLS 627 Developmental Neurobiology (3 cr)
- GPLS 630 Fundamentals of Biostatistics (2 cr)
- GPLS 641 Systems and Cognitive Neuroscience (3 cr)
- GPLS 645 Cell and Systems Physiology (3 cr)
- GPLS 702 Basic Immunology (3 cr)
- GPLS 709 Advanced Biochemistry (3 cr)
- GPLS 710 Principles of Microbial Pathogenesis (3 cr)
- GPLS 712 Human Cytogenetics (2 cr)
GMLS 714 Muscle: C&E – Contraction Coupling (3 cr)
GMLS 721 Imaging Methods in Membrane Biology (2 cr)
GMLS 737 Proseminar in Exp Design (2 cr)
GMLS 790 Advanced Cancer Biology

**Fall**
GMLS 604 Neuropharmacology (3 cr)
GMLS 616 Molecular Mechanisms of Signal Transduction (3 cr)
GMLS 620 Synaptic Physiology/Pharmacology (3 cr)
GMLS 623 Molecular Toxicology (3 cr)
GMLS 631 Cardiac Cellular Physiology (2 cr)
GMLS 635 Bacterial Genetics (4 cr)
GMLS 644 Intro to Membrane Biophysics (1 cr)
GMLS 665 Cancer Biology: From Basic Research to the Clinic (3 cr)
GMLS 701 Advanced Molecular Biology (3 cr)
GMLS 704 Principles of Virology (3 cr)
GMLS 706 Human Genetics Seminar (1 cr)
GMLS 705 Basic Human Genetics I (4 cr)
GMLS 717 Genomics of Model Species and Humans (3cr)
GMLS 722 Genetics and Metabolism (2 cr)
GMLS 750 Topics in Molecular Medicine (2 cr)
GMLS 769 Advances in Immunology (3cr)

¹Some courses are offered only every other year.

Course information and prerequisites are available online in the GPILS Course Catalog [http://lifesciences.umaryland.edu/Pages/course_catalog.aspx](http://lifesciences.umaryland.edu/Pages/course_catalog.aspx).

**NOTE:** Other Graduate School courses may qualify as electives, but are subject to approval, as they must be relevant coursework towards the PhD degree.

Y. 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.

<table>
<thead>
<tr>
<th>Training Program</th>
<th>Granting Agency</th>
<th>Principal Investigator</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary Training in Cardiovascular Disease</td>
<td>NIH/ NHLBI</td>
<td><strong>Dudley Strickland, Ph.D.</strong></td>
<td><a href="mailto:dstrickland@som.umaryland.edu">dstrickland@som.umaryland.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Departments of Surgery and Physiology, Center for Vascular and Inflammatory Diseases</td>
<td></td>
</tr>
<tr>
<td>Training Program in Integrative Membrane Biology</td>
<td>NIH/ NIGMS</td>
<td><strong>Matthew Trudeau, Ph.D.</strong></td>
<td><a href="mailto:mtrudeau@som.umaryland.edu">mtrudeau@som.umaryland.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Physiology</td>
<td></td>
</tr>
<tr>
<td>Interdisciplinary Training Program in Muscle Biology</td>
<td>NIH/ NIAMS</td>
<td><strong>Martin Schneider, Ph.D.</strong></td>
<td><a href="mailto:mschneid@umaryland.edu">mschneid@umaryland.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Biochemistry Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>Training Area</td>
<td>NIH/NIC</td>
<td>Investigator</td>
<td>Email Address</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---------</td>
<td>----------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Training in Oral and Craniofacial Biological Sciences</td>
<td>NIDCR</td>
<td>Sharon Gordon, Ph.D.</td>
<td><a href="mailto:sgordon@umaryland.edu">sgordon@umaryland.edu</a></td>
</tr>
<tr>
<td>Research Training in Gastroenterology</td>
<td>NIDDK</td>
<td>Jean-Pierre Raufman, M.D.</td>
<td><a href="mailto:jraufman@medicine.umaryland.edu">jraufman@medicine.umaryland.edu</a></td>
</tr>
<tr>
<td>Immunity and Infection</td>
<td>NIAID</td>
<td>James Kaper, Ph.D.</td>
<td><a href="mailto:jkaper@umaryland.edu">jkaper@umaryland.edu</a></td>
</tr>
<tr>
<td>Training Program in Cancer Biology</td>
<td>NCI</td>
<td>Toni Antalis, Ph.D.</td>
<td><a href="mailto:tantalis@som.umaryland.edu">tantalis@som.umaryland.edu</a>, Departments of</td>
</tr>
<tr>
<td>Signaling Pathways of Innate Immunity</td>
<td>NIAID</td>
<td>Stephanie Vogel, Ph.D.</td>
<td><a href="mailto:svogel@som.umaryland.edu">svogel@som.umaryland.edu</a></td>
</tr>
<tr>
<td>Meyerhoff Training Program/Expanding participation by minorities in biomedical sciences</td>
<td>NIGMS</td>
<td>Michael Summers, Ph.D.</td>
<td><a href="mailto:summers@hhmi.umbc.edu">summers@hhmi.umbc.edu</a>, UMBC,</td>
</tr>
</tbody>
</table>

For a complete list of NIH sponsored training programs at the University of Maryland School of Medicine refer to http://lifesciences.umaryland.edu/Pages/TrainingGrantsOnCampus.aspx.

### Appendix 1: Timeline for Ph.D. Program in Molecular Medicine

<table>
<thead>
<tr>
<th>Ph.D. Timeline</th>
<th>Step towards degree</th>
<th>Actions to be taken</th>
</tr>
</thead>
</table>
| **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 Program Manager to unlock registration.  
- Log in to SURFS and enroll in courses. |
| **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 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 mentor agreement form to Program Manager. |
| **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 that qualifying exam form is complete and submit to Program Manager. |
| 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 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 Program Manager 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. |
| By fall of year 5 | Molecular Medicine Seminar Presentation | - Sign up in late July/early August prior to fall semester of year 5  
- 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 Calendar |
| Final Semester | Doctoral Dissertation Defense | - Organize and prepare dissertation according to Graduate School requirements: Thesis and Dissertation Style Guide  
- Submit Completion of Dissertation form signed by Readers and CV to Program director for signature.  
- Submit all required graduation paperwork: Graduate School Calendar - Schedule room and time to defend. Be sure to inform Program Manager 2 weeks prior to defense. |
| After successfully defending | Keep abreast of program activities and developments | - Complete and submit alumni form |

Appendix 2. Timeline for M.D./Ph.D. Program in Molecular Medicine*

<table>
<thead>
<tr>
<th>M.D./Ph.D. Timeline</th>
<th>Step towards degree</th>
<th>Actions to be taken</th>
</tr>
</thead>
</table>
| 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 Program Manager. |
| 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 Program Manager. |
### 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 Program Manager 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.

### By fall of year 4-5

**Molecular Medicine Seminar Presentation**

- Sign up in late July/early August prior to fall semester of year 5
- 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 individual development plan form*.

### Start of final semester

**Graduate School Paperwork**

- Follow all deadlines: Graduate School Calendar

### Final Semester

**Doctoral Dissertation Defense**

- Organize and prepare dissertation according to Graduate School requirements: *Thesis and Dissertation Style Guide*
- Submit Completion of Dissertation form signed by Readers and CV to Program director for signature.
- Submit all required graduation paperwork: Graduate School Calendar - Schedule room and time to defend. Be sure to inform Program Manager 2 weeks prior to defense.

### After successfully defending

**Keep abreast of program activities and developments**

- Complete and submit alumni form

---

*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 COGS is obtained, Ph.D. 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. M.D./Ph.D. 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 hrs 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 (Appendix 5) 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 Program Manager.

**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.

o 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.

o 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.

o 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).

o 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?
Appendix 4:

**Guidelines for Molecular Medicine Seminar Presentation**

The student should prepare a formal seminar approximately 40 minutes in length, such as would be presented 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 you are addressing, your hypothesis and how it was derived, your data and how it addresses the problem and its impact on the field of study. The biggest problem is that when students are presenting their data it is not always clear how the data they have generated addresses their hypothesis and more importantly, how their studies fit in the broader context of the field and how the studies impact the field.

**Suggested structure for your Molecular Medicine Seminar presentation:**
- **Introduction**
  - Brief introduction about the importance of the field
  - Identify important question(s) in the field
  - Derive a hypothesis that you will test based on previous studies in the field and that address one of the important questions you described
- **Proceed to present your 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
- **Present a compelling model that summarizes your data**
  - You may want to present several smaller models as you go through your data and then a final model that brings the talk together
- **At the end, you may want to briefly outline your plans for future work or outstanding questions still to be addressed if time permits**
- **Present your acknowledgments**
- **Be prepared to answer questions**

**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 peers and mentor to review the seminar. You should also consider a reviewer who does not work in your area of expertise
- Less can be more. Keep the seminar to 40 min, but 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 sec to 1 min per slide
- If you are not going to explain something that appears on the slide, delete that part of the slide
- Don’t use complicated models from review articles. If you want to use a model, delete what is not germane to your presentation.
- Done well, this seminar can serve as the basis for your Thesis Dissertation seminar.

**Assessment:**

Seminars are assessed by a Molecular Medicine Peer Review Panel and the Faculty Coordinator 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:

Additional information and Forms available online at [http://lifesciences.umaryland.edu/molecularmedicine/student.aspx](http://lifesciences.umaryland.edu/molecularmedicine/student.aspx)

- Student Progress Form GRA I
- Student Progress Form GRA II
- Lab Rotation Proposal Form
- Lab Rotation Completion Form
- Mentor Agreement
- Qualifying Exam Form
- Thesis Advisory Committee Approval Form
- Thesis Advisory Committee Meeting Form and IDP
- IDP
- Thesis Proposal Form
- Thesis Committee Change Form
- Alumni Form
- Course Registration Form
Signature Page

(Please make a copy of this page and give the original signed version to the Program Manager)

I have read the contents of this handbook and understand the policies of the Graduate Program in Life Sciences Molecular Medicine Ph.D. Program:

Printed Name: _________________________________

Signature: _____________________________________

Date: _________________________________________