Program Guidelines

Revised March 2016

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PROGRAM IN EXPERIMENTAL AND MOLECULAR MEDICINE

I. ADMINISTRATION OF THE PROGRAM

The Director of PEMM is appointed by the Dean of the Medical School and will serve with a 3 year appointment, renewable one time for a maximum service of 6 years. The Director is Chair of the Graduate Program Committee (GPC) that has the responsibility to oversee the graduate program. The GPC is comprised of the Chair of each theme-specific Graduate Education Committee, plus two graduate student representatives serving two year terms (one new member appointed each year).

The responsibility of the GPC is to oversee all facets of the Program, including the selection and admission of applicants, monitoring the progress of each new student until s/he selects a specific theme and a thesis advisor and reviewing the academic performance of all students in the PEMM program. The committee will also review the activities of the individual themes to ensure adherence to the Program guidelines, to discuss any proposed modifications, and to review the ongoing growth and evolution of the program. Finally, the individual Graduate Education Committees (GEC) will nominate and approve faculty for appointment to PEMM.

Each theme will appoint its own GEC and Chair (no term limits). The responsibility of each GEC is to provide oversight of the curriculum requirements of the theme, including courses, journal clubs and research-in-progress, approve the composition of the Student Advisory Committees, and oversee the grant writing/qualifying exam. The Chair of each GEC will serve as a member of the GPC. The Chair should maintain communication with all members of the theme and act as the first point of contact for all questions, suggestions and concerns.

II. QUALIFICATIONS AND REQUIREMENTS FOR ADMISSION

The basic requirement for admission is a bachelor's degree with adequate preparation in chemistry, biology, biochemistry, physics and mathematics. A demonstrated proficiency with the English language is also required. A Graduate Record Examination score is required except in the case of applicants to the M.D./Ph.D. program where a Medical College Admissions Test score is acceptable. In addition, the applicant must supply at least three letters of recommendation, all official academic transcripts and a completed Dartmouth College application form for graduate study. It is the long-standing policy of the College to actively support equality of opportunity for all persons regardless of race or ethnic background, and no student will be denied admission or be otherwise discriminated against because of race, color, sex, religion, age, national or ethnic origin.
III. REQUIREMENTS FOR A Ph.D. DEGREE

REQUIRED:
Two-term core course (PEMM 101, 102)
Three research rotations in first year (PEMM 141, 142, 143)
Biostatistics course (PEMM 103)
Ethical and Responsible Conduct of Research (UNSG 100 for fall term and PEMM 124 for Winter Term)
A minimum of four elective courses
The preparation of a written grant proposal and oral defense (PEMM 137)
Attendance at and participation in journal club meetings, RIP (Research in Progress) sessions and seminars. Students will be expected to present at a journal club every year, and present their research annually starting in year 2 in either a RIP or seminar format.
Preparation and presentation of a thesis (seminar and defense)

The following courses represent the typical electives for a student in each area of concentration. A typical elective course involves approximately 30 h of contact time; some courses may involve more hours and count as a 2-credit elective.

**Biomedical Physiology & Immunotherapy**
Year 1 PEMM 271 - Advanced Biomedical Sciences (2 course equivalent)
Year 2/3 Two additional elective courses
**OR**
Year 1 MICR 144- Cellular and Molecular Basis of Immunity
Year 2/3 Three additional elective courses

**Cancer Biology & Molecular Therapeutics**
Year 1 or 2 PEMM 126 - Cancer Biology
Year 2/3 Three additional elective courses

**Molecular Pharmacology, Toxicology & Experimental Therapeutics**
Year 1 or 2 PEMM 131 - Experimental Therapeutics
Year 2/3 Three additional elective courses

**Neuroscience**
Year 1 MDED 115 – Geisel Medical School Year 1 Neuroscience course with supplemental experimental neuroscience section (2 course equivalent)
Year 2/3 Two additional elective courses

A full time student must register for 3 course equivalents each term. In the early terms, this will include a research rotation, and one or two courses. If necessary, the appropriate thesis research number will be used to maintain the required 3 credits each term. PEMM 297 equals 1 course credit, 298 equals 2 course credits, and 299 equals 3 course credits.

ELECTIVES: An outline of the plan for electives must be developed with the student’s advisor committee once established. Electives may be selected from courses offered by the Program and
also by other graduate programs in the Medical School or Departments in the College. The criteria for approving a course for graduation resides with the student’s advisory committee.

EXCEPTIONS: Advanced students joining the PEMM program will receive appropriate credit for comparable courses successfully completed in a former graduate program.

THEMES
Students will focus their academic and research activities primarily within an area reflecting the interests of their thesis advisor. The requirements for a PhD degree described here for each theme should be considered a minimum. Each theme’s Graduate Education Committee may propose additions or variations to the required graduate program. Additional requirements will be reviewed and approved by the GPC. Any decrease in requirements would require approval by the Dartmouth College’s Council for Graduate Studies. In addition, a Student Advisory Committee may propose additional requirements to enhance a student’s training in a particular area.

IV. RESEARCH ROTATIONS

Concept
A brief introduction to specific aspects of research provides the student with a general appreciation of various research areas and approaches. The purpose of the research rotations is to allow the student to obtain basic training in a variety of laboratory techniques and methods, and to identify a faculty member as a potential thesis advisor.

Expectation
The rotations will be assigned by the Graduate Program Committee taking into consideration the preferences of the students and availability of working space and resources of the faculty laboratories. The first rotation will be assigned by the GPC based on a list of three faculty members to be submitted by the student no later than one month prior to starting the program. The second and third rotation assignments will be determined once the student has had an opportunity to meet with individual faculty, and discuss areas of mutual research interest. A list of preferences for both the second and third rotations should be submitted to the GPC no later than one month prior to completing the first rotation. The Graduate Committee will make every effort to match assignments with preferences. A delay in selecting a potential third rotation advisor may limit the choice available as a desired advisor may already have committed to a different rotation student.

At least two of three rotations must be performed with members of PEMM. It is expected that the three rotations will be completed within nine months and written justification must be submitted to the Graduate Committee for permission to extend any one research rotation beyond one quarter.

Upon completion of a rotation, a written report must be submitted to the rotation advisor for discussion and evaluation and to help in the determination of a grade for the rotation. A copy of the report must be submitted concurrently to the PEMM administrator. These reports should
generally be between 5 and 10 pages plus figures and/or tables, and written in the form of a scientific publication (see Appendix I for suggested format). A rough draft of this report must be submitted to the rotation advisor before the start of the next rotation; a student will not be permitted to start the next rotation until the first draft has been submitted. The rotation advisor may return the report within 2 weeks with suggested revisions. The final report must be submitted to the advisor as soon as possible but no later than 3 months after completion of a rotation. The faculty member will submit a copy of the report and a grade (HP, P, LP, NC) to the PEMM Coordinator. Reports submitted after the required time frame will not be eligible for a grade of HP. A student must obtain a passing grade in three rotations; a fourth rotation may be taken to achieve this end if necessary. It is expected that a thesis advisor will be selected from one of the three rotations; only under exceptional circumstances will a fourth rotation be permitted.

Exemptions

A student with extensive experience in a specific area of research relevant to the graduate training program may petition the GPC for an exemption of one research rotation.

Selection of advisor and theme

The thesis advisor should be identified no later than May 1 of the first year of study, and the student should begin his/her thesis research no later than June 1. Once the student and advisor have identified a potential area for the thesis research, the Student Advisory Committee must be formed (see below). This committee will also serve as the Thesis committee at the time of the defense of the thesis.

PEMM provides financial support for the student stipend during the first year; the thesis advisor is responsible for support of the stipend thereafter. All sponsoring faculty in conjunction with their students should attempt to secure individual support for each student either through pre-doctoral fellowships or by the inclusion of salary support as graduate research assistants in grant applications. Graduate students will be encouraged to apply for individual fellowship support during their graduate training period.

Students may choose to perform their thesis research with a faculty member in a graduate program other than PEMM. This may require that the student transfer to the graduate program of that advisor. An exception to this policy can be made if there are specific circumstances whereby the student and advisor agree that remaining in PEMM is in the best interests of the student’s training. These circumstances must be outlined in a letter to the PEMM GPC who must approve the request before the student can begin the thesis research.
V. QUALIFYING EXAMINATION FOR THE Ph.D.

Philosophy and purpose

Effective writing of grant applications is required for a successful career in research. The grant application component of the graduate program is both a training exercise to help develop grant writing skills and a qualifying exam. Learning how to compose a defendable hypothesis is an essential component of the training of a graduate student. Students should be able to develop a novel line of research, propose a hypothesis, and develop a series of experiments to test this hypothesis. A student must be able to defend the proposal at an oral examination. At the same time, the student should also demonstrate knowledge of the larger field of Experimental and Molecular Medicine reflected in the general area of the proposal and material covered in completed coursework. The ability of a student to accomplish this endeavor will represent the qualifying exam, which should be submitted by July 1 following her/his second year in the graduate program.

Selection of subject

The Qualifier Exam topic is to be based on the student's proposed thesis project or an approved topic of their choosing. The student will develop specific aims for the research proposal. The student is encouraged to interact with his/her advisor and the exam committee members in developing and focusing the specific aims. However, the student is responsible for the development of the scientific focus of the proposal. The student will submit the proposal title and specific aims to the advisor and committee members according to the timeline (see below).

Qualifying Committee

The Qualifying Committee will be composed of three faculty, selected by the PEMM Graduate Theme Committee (GTC) overseeing the student’s area of specialization. One Qualifying Committee member should also be a member of the GTC. The PEMM GTC will designate one of the chosen PEMM faculty members to serve as “Chair” of the Qualifying Committee. The student's dissertation advisor will not serve as a member of the examining committee but the advisor's approval of the topic, specific aims, and the final written proposal are required. The student is responsible for meeting all deadlines and for setting a time and place for the oral examination. The Chair is responsible for the conduct of the examination, and for the preparation of correspondence; critique of the written proposal and reporting progress and results to the PEMM GTC Director and administration.

The student’s faculty advisor is encouraged to attend the oral examination as a non-examining, non-voting, and generally non-contributing observer. At the request of the committee, the advisor may provide information to clarify an area of confusion; in these situations, the advisor serves as a resource to the committee and may not participate by examining or answering for the student.

Written research proposal – Specific Aims page

The specific aims page should contain an introductory section (typically 0.5 page) that places the experimental aims in context and includes references. The specific aims page should include a hypothesis and the proposed experimental approaches/measures, model systems,
and/or population/data resources to be used in testing that hypothesis. In addition, students are encouraged to consider and include a brief statement of the impact of their results assuming successful completion of the proposed aims (typically at the bottom of the page). Minor modifications to the specific aims may be made as the written proposal is prepared but major changes should be approved by the examining committee. In its final form, the specific aims will be the first page of the written proposal. During the period of topic selection and development of specific aims, students are expected to maintain full-time involvement in coursework and laboratory activities.

The aims will be reviewed by the students Qualifying Committee, and revision suggestions will be presented to the student. Revised aims are due May 1 (see the timeline section below).

The following are the criteria for evaluation and approval of the specific aims:

i. Is studying and writing about the topic of the proposal likely to be a sound educational experience for the student? The qualifying exam should enhance knowledge and understanding in fields related to the student's Ph.D. dissertation project.

ii. Do the aims address important questions in the field? The aims should be "hypothesis driven" rather than descriptive.

iii. Are the proposed methods reasonable and feasible using current technology? If not, has the student proposed new approaches that have a reasonable probability of succeeding?

iv. Can the proposed experiments be completed within the timeframe of a student's Ph.D. candidacy?

v. Is the style and level of detail of the specific aims appropriate for a grant application (e.g. NIH NRSA F31)?

Timeline

The deadline for submission of the completed application will be July 1 although this does not preclude earlier submission. Early submission of the Specific Aims page is encouraged, as this will provide more time for completion of the grant application. Additional guidelines for preparation of a grant application are included below. This schedule shows the latest acceptable dates. Students may begin the qualifying process at any time after January 1 of their second year and thereby extend the amount of time available to them to complete each step.

The entire qualifying examination should be completed by December 1 of the student's third year of graduate work. If the exam is not completed by this time, these are grounds for not permitting the student to enroll for the following fall term as a Ph.D. student. During the time when the written proposal is being prepared, students are expected to discuss their research schedule with their advisor since it is understood that writing the qualifying exam will take a considerable amount of time and effort.

No later than May 1 of the student's second year in the Program, the topic and specific aims must be approved by the examination committee members chosen by the Graduate Theme Committee (GCT). The committee member names, abstract title and specific aims should be
submitted to the PEMM Graduate Theme Committee (GTC) director and program administrator.

Summary of timeline

January        Orientation of students to grant writing exercise
January – February 1 Preliminary development of proposal hypothesis and aims
March 1        Student submits topic and hypothesis to GTC
February – March Selection of Qualifying Committee members
April 1        Specific aims are submitted to Qualifying Committee
April 15       Exam committee returns advice to student
May 1          If necessary, revised specific aims are submitted to the Qualifying Committee
July 1         Student submits completed proposal to Qualifying Committee
July 15        Qualifying Committee returns comments to student
August 15      Oral defense

The Written Research Proposal – Research Strategy

The written portion of the qualifying examination is a research proposal written by the student. The research strategy section follows the aims page. Once the student's topic and specific aims have been approved, the student will have eight weeks to complete the written proposal. The proposal should be written entirely by the student. Scientific evaluation of the written proposal is the responsibility of the Qualifying Committee, not the advisor. However, the written proposal must be approved by the advisor before it may be submitted to the Qualifying Committee. The advisor should not approve the proposal if it is difficult to understand due to the writing style, grammatical errors, or a failure to provide sufficient background or experimental detail. The advisor should ensure that the proposal conforms to the length and format requirements for NIH grants. Of course, in writing the proposal, the student may not copy from grant applications or elsewhere; plagiarism is grounds for dismissal from the program.

Written Qualifying Exam Format and Organization

General Format:

i. The entire research proposal (Specific Aims and Research Strategy) is limited to seven pages, including the specific aims page, and not including references cited. No materials may be included in any appendix, and proposals exceeding the page limit will be returned to the student without review.

ii. Typeface size – NIH rules (11pt min) Arial or Helvetica

iii. The proposal should be single-spaced.

iv. Margins must be at least 0.5” on all sides.

v. All pages should be numbered.

vi. A list of cited references should be included after the research description section. There is no length limit for the reference list. Citations in the reference list should be complete, and contain all authors’ names, full title, year of publication, journal, journal volume, and page numbers. The format of the reference list in NIH format
should serve as a model. Students are urged to cite original references rather than review articles.

vii. Citations in the text of the proposal can either be numbered (e.g. as in a *Nature* paper) or use the author/year format (e.g. as in a *Cell* paper).

viii. Inclusion of relevant figures and tables is encouraged. The figures and tables should be embedded in the text.

ix. The Chair of the Qualifying Committee should examine the proposal for compliance with format requirements as soon as possible after receiving it. Proposals which do not adhere to all format specifications will be returned to the student without evaluation. In such situations the Chair should provide written guidelines to the student describing why the proposal is being returned. The Chair should also inform the student about the amount of time available for bringing the proposal into compliance with the format requirements. It is anticipated that most modifications needed to bring the proposal into compliance can be completed in less than a week. This does not constitute the one permitted revision of the written proposal.

Organization:
The research description should contain the following subsections:

x. **Specific Aims.** Introduce the topic and provide a very brief background sufficient to place the actual specific aims in context. The hypothesis should be clear, the specific aims should be listed, and the proposed experimental approaches briefly described. In addition, students are encouraged to include a statement of impact.

xi. **Significance.** Explain the importance of the problem or question the proposal seeks to address. Describe the scientific premise for the project, including any preliminary data supporting the proposed hypotheses and/or approaches. Explain how completing the proposed project will improve scientific knowledge and impact the field of study.

xii. **Innovation.** Describe any novel approaches, methodologies, or theoretical frameworks to be developed or used, and their advantages over existing resources. Explain how the proposal challenges current research paradigms.

xiii. **Approach.** Describe the proposed experiments, specifically the rationale, the methods to be used, and the likely outcomes and interpretations of the experiments. Proposals may contain a "Preliminary Results" section in the approach since the topic may be based on dissertation research. The experimental plan should be divided into sections that correspond to the specific aims. Predoctoral fellowship applications propose a body of work that can be completed by a single person in a three year period. Length 5-6 pages. Provide experimental detail sufficient for the committee members to understand the experimental approaches planned and possible limitations or concerns with using the planned approaches. Do not provide excessive details of standard techniques and approaches, more detail can be provided for novel approaches. Students should consult the examining committee Chair if they have questions about how much experimental detail to include.

xiv. **Timeline.** A timeline outlining what work will be done in each year of the grant (less than 0.25 pages).
**Evaluation and defense of the proposal.**

The proposal must be submitted by the established deadline and will be reviewed within two weeks by the Qualifying Committee. The committee may recommend an oral defense, deferment, or rejection. In each case, the student will be provided with a critique that will highlight the most important questions and concerns of the committee. It is expected that an oral defense (if recommended) will occur within one month of the recommendation to proceed.

If the committee requests revision of the written proposal, a written critique of the proposal will be synthesized by the Chair from the concerns and suggestions from all committee members. The written critique should provide feedback to the student on specific areas where the proposal needs improvement. The student is advised to discuss with the Qualifying Committee Chair how to address the concerns raised in the written critique.

Specific criteria that will be evaluated in the written proposal include:

a. Adherence to length and format rules. Noncompliant proposals will be returned without review.

b. Is there sufficient detail to understand and evaluate the proposed experiments?

c. Is the rationale for each experiment clearly described?

d. Is sufficient – and not excessive – detail on methodology provided?

e. Are potential outcomes and interpretations of possible outcomes described?

f. Have alternative approaches been considered if the method of choice does not work?

g. Is the grant written in a style appropriate for a research grant?

h. Is the timetable for the work provided by the student realistic?

If recommended for an oral defense, the student will present a brief overview of the proposal, including a discussion of the comments in the critique. The student should also be prepared to address any related scientific or technical aspects that the committee may raise. A major goal of the defense is to determine the student’s knowledge and ability to "think on his/her feet." The committee will confer in advance of the oral defense to define the most pertinent questions that warrant appropriate answers. Based on the response to these questions, and the overall quality of the application, the committee may recommend pass or fail; in the case of a pass, the committee will assign a grade of HP, P or LP.

A decision on the written proposal may be deferred if the committee believes that the application has merit but requires rewriting. The major reason for such a decision will be that the student would benefit from additional practice at formulating ideas and presenting them in a clear and succinct proposal. The proposal must then be resubmitted within a month. The committee may recommend pass or fail; in the case of a pass, the committee will assign a grade of P or LP.

Guidelines to assist students in preparing for the oral examination:

i. The student should be familiar with the theoretical and factual background relevant to their proposal at a level expected for a second year PEMM graduate student.
members of the Qualifying Committee are free to ask questions broadly related to the proposal and to areas that constitute the background for the proposal. The student should be able to place the topic of their proposal in the context of the broad field of integrative biomedical sciences. If the student has been informed by the examining committee that a revised written proposal still has substantial deficiencies, the student should be prepared to address these during the oral examination.

ii. Students should be conversant with the literature in the field(s) covered by their proposal, including those papers that deal with matters of general significance as well as those that relate directly to the proposed research at a level expected for a 2nd year doctoral candidate. The committee will expect the student to have an appreciation of the development of ideas (historical perspective) in this field and the potential role of current ideas in guiding the field in the future.

iii. Students should be able to consider and generate alternative approaches and should be prepared to interpret hypothetical outcomes proposed by examiners.

iv. Students should be thoroughly familiar with the technical aspects of their proposal. They should have a solid understanding of the techniques they propose to use. They should be aware of the advantages and limitations of these techniques. They should be prepared to defend why they have chosen a particular technique or approach rather than alternative ones that might be available.

v. The committee may also test the following aspects of the student's background and ability:

- Is the student able to critically evaluate original scientific articles?

- Has the student designed experiments that address the specific aims and which have the potential to add new and useful information to the field of investigation?

If the application is graded NC, either in its original form or after the defense, and the student has not previously accumulated two deficient grades (either LP or NC), the student will have one chance to repeat the exam. The time frame for resubmission must not exceed 6 months from the date of recommendation.

Repeating the oral qualifying examination:

In the event that the student fails the oral examination, the student will have one opportunity to repeat the oral examination. The second administration of the oral should occur within one month after the first oral examination. If a second failure occurs, the student will not be advanced to candidacy for the Ph.D. degree, and normally will be unable to remain in the Ph.D. program. If it is determined appropriate upon review, the student may opt to leave with a masters in the program if the appropriate coursework is completed. The final determination for this will be subject to review by the PEMM GTC and program Directors.
vi. Expectations for Dissertation Research Work during Qualifying Exam:

Prior to submission of the topic and specific aims, students are expected to maintain full (i.e. 100%) presence in the lab, teaching, and coursework. It is not acceptable, for example, for students to disappear from the lab for weeks or months for the purpose of generating the aims for the qualifying exam. Students are encouraged to begin the discussions and background reading needed to select a topic early in their second year of study. Once the topic and aims are approved, students have 8 weeks to prepare and submit the written proposal. Prior to writing their proposal, students are expected to discuss their research schedule with their advisor since it is understood that writing the qualifying exam will take a considerable amount of time and effort.

Students should anticipate that several weeks are required to do the background reading needed to select a topic and to formulate specific aims. It is strongly recommended that students begin this process early, perhaps during the summer between the first and second years of graduate study. The entire process may be completed sooner than the designated dates, and this is encouraged. Departures from the time line for the qualifying exam specified here require the prior approval of the PEMM GTC and program Directors.

VI. THESIS RESEARCH

The goal of the Ph.D. program is to prepare students for a successful research career whether it is to be in an academic, government or industrial environment. This is achieved primarily through the pursuit of an independent research project in the laboratory of a faculty advisor. To ensure that students graduating from the program are of high quality and consistent with the philosophy that students should make a meaningful contribution to their field, it is expected that, by the time of the dissertation defense, the student will have published first-authored, experimentally based manuscripts in peer-reviewed journals. Often the best thesis represents the work contained in two or more papers (perhaps several published and others submitted), and in such case, the student will be able to use these as the body of the thesis, which will then be framed by an introduction and final discussion. It is worth emphasizing that a strong publication record is essential to the student in achieving her/his long-term career goals.

Student Advisory Committee

The Student Advisory Committee (SAC) will be established immediately upon selection of a mentor. This will be done by the student and the advisor and must include a minimum of four members, two of whom must be PEMM faculty and one of whom must be from another Institution (the latter member is often appointed after the student has been in the program a couple of years). The GEC must approve the membership of the SAC and the chair of the GEC will be an \textit{ex officio} member of all advisory committees. The intent is to assemble a group of consultants with whom the student should meet on a regular basis to discuss aspects of her/his research project and curriculum. The responsibility of the committee members should also include attendance at, and evaluation of the student oral presentations such as journal clubs and RIPs, and providing constructive input to further the student’s training.
The SAC must meet at least once a year. Meetings may be scheduled on a more frequent basis at the request of the advisor, the SAC or the student. A brief status report must be submitted to the SAC at or before the time of the meeting (often the slides of the presentation). This report should reflect the progress and the problems encountered with the thesis project, and also the status of course work for those students who have not yet completed their requirements. This report and a brief summary of the meeting must be submitted to the GEC coordinator within one week of the meeting.

**Thesis Defense**

The Student Advisory Committee will become the Thesis Committee for the purpose of evaluating the thesis and the oral defense. The committee must certify that the student is ready to submit his/her thesis. The thesis will be submitted to the Committee and a date for the Defense seminar will be established. There must be at least 14 days between submission of the thesis and defense to permit adequate review of the thesis. If the Committee determines that the thesis is not ready for oral presentation, they may cancel the defense no later than 7 days in advance of the proposed date. The seminar will be open to the public and will be widely announced. The Seminar will be followed by a defense of the thesis conducted by the Thesis Committee. Corrections to the written document must be made within one month or as determined by the Thesis Committee. Recommendations for awarding the Ph.D. degree will be made by the Director of PEMM upon the advice of the Advisory Committee.

**VII. GRADING STANDARDS FOR STUDENTS PURSUING A Ph.D. DEGREE IN THE PROGRAM IN EXPERIMENTAL AND MOLECULAR MEDICINE**

The following standards of performance are those expected to be achieved by every student while fulfilling the course requirements for the degree of Ph.D. Failure to meet these standards may result in separation from the program. Review of the academic performance of all students will reside with the Graduate Committee who will be advised by the appropriate theme-specific GEC.

1. Graduate students shall be graded according to the scale; High Pass (HP), Pass (P), Low Pass (LP), No Credit (NC). An “incomplete” grade may be filed under special circumstances, but the requirement must be fulfilled and a final grade filed within one year.

2. A minimum grade of "Pass" is expected in all courses. The Graduate Committee will review the record of any student who receives a Low Pass (LP) or "no credit." A minimum requirement for graduating will be an average grade of Pass in the four thematic courses.

3. A review of performance by the Graduate Committee will result in a recommendation that
   (a) no action is necessary
   (b) the receipt of a "Low Pass" or "No Credit" grade constitutes a deficiency which must be removed either by repetition of the course, special examination or other arrangement.
(c) the student discontinues the pursuit of a Ph.D. degree in the Program in Experimental and Molecular Medicine.

4. The Committee will use the following guidelines for arriving at a recommendation (the term "course" includes grades obtained in the qualifying exam).

(a) If a student receives a grade of "Low Pass" in a course, the Committee may recommend options 3(a), (b) or (c).

(b) If a student receives a grade of "No Credit" in any course, or "Low Pass" in any two courses, options 3(b) or (c) must be followed

(c) If a student receives a grade of "No Credit" in any two courses the Committee must recommend option 3(c).

(d) If a student receives more than two deficient grades (either LP or NC) the Committee must recommend option 3(c).

(e) If a student fails to sufficiently improve his/her performance (as judged by the Committee) within one academic year after a performance review recommendation, the Committee must recommend option 3(c).

VIII. M.S. DEGREE REQUIREMENTS

While the primary goal of the PEMM graduate program is the pursuit and award of a Ph.D. degree, occasionally students will choose to terminate early with the award of an M.S. degree. The requirements for M.S. degree are as follows.

1. Successful completion of the following courses
   a) PEMM 101 and 102
   b) Biostatistics course (PEMM 103)
   c) Ethical and Responsible Conduct of Research (PEMM 124)
   d) 2 elective course equivalents

2. Completion of three rotations (PEMM 141, 142, 143)

3. Participation in Journal Clubs, Research in Progress and Seminar series

4. Research Thesis to be read by a committee of three faculty (a member outside of Dartmouth is not required)

5. Public Seminar related to thesis work (the research-in-progress presentation is an acceptable forum)

IX. M.D.-PH.D. REQUIREMENTS
M.D.-Ph.D. students begin the combined program by completing the first two years of Geisel Medical School. The students will also complete two summer research rotations; the first taking place in the summer between medical school years one and two, and the second rotation occurs following the second year of medical school. A thesis lab may be chosen after the second rotation. Students that have not successfully identified a thesis mentor from either of the first two rotations may opt to take a third research rotation immediately following the second research rotation. Once an MD-PhD student chooses his/her PEMM lab, the student formally becomes a member of the PEMM program and begins working full time on his or her PhD.

MD-PhD students are exempt from PEMM 101, 102, and 103. Some MD coursework may be considered equivalent to some PEMM coursework, so MD-PhD students may be exempted from some elective PEMM courses. MD-PhD students often take two PEMM courses beyond their MD coursework and are responsible for completing all other PEMM requirements, which include: (1) a qualifying exam, (2) attendance at Program functions, (3) an approved ethics course (4) a thesis, and (5) a thesis seminar and defense. Program functions include journal club participation, Research-in-Progress seminars (RIPs), and program seminars.

X. VACATION AND LEAVE POLICY

The normal appointment to a position in the Graduate Program is full-time with no more than 20 days of annual vacation. This time allowance includes the official holidays granted to Dartmouth College employees. Arrangements for leave must be made in consultation with the student's faculty advisor and should not compromise fulfillment of any obligations regarding coursework or research activities required of the student. It is usually inappropriate to take vacation during the first year in the program because of the need for timely completion of research rotations and selection of a thesis advisor by May 1. As stipend support after year 1 becomes the responsibility of the advisor, a vacation that results in delay in starting in a thesis laboratory beyond June 1 may result in a gap in stipend support.

In some instances it is appropriate for a student to spend time away from Dartmouth in other laboratories, and such experiences should be planned in consultation with the student's advisor. Time spent in such activities does not count as vacation.

Under the child accommodation policy, a full-time stipend-supported graduate student is eligible for up to twelve weeks of paid accommodation from his or her graduate program.

XI. STUDENT GRIEVANCE PROCEDURES

The committee-based process for guiding the graduate program, while primarily designed to ensure effective mentoring, is also intended to guard against biased treatment of any individual. Although rare, allegations can occur of professional misconduct (e.g. cheating, plagiarism, data alteration, conflict over data ownership or access, etc.), personal misconduct (e.g., sexual impropriety, harassment, etc.) or simply distraught people caught in a stressful mentoring relationship that appears to require an unbiased third party for resolution. The latter situation can arise when there is a misconception from either faculty or student about expectations for what constitutes satisfactory progress.
The guidelines for the graduate program have been developed to ensure adequate communication between students and Program faculty. On joining PEMM, all graduate students will meet with the Director and members of the Graduate Committee who will oversee their progress during the first year. Upon selection of a research theme, a student will be overseen by a Graduate Education Committee. Once a research advisor has been identified, the Thesis Advisory Committee will be established, and this committee is mandated to meet with the student at least annually. These guidelines will avoid the situation whereby student progress is being monitored by a single individual without input from other faculty who can provide a broader assessment of progress. This level of oversight protects everyone by helping to ensure a fair, transparent and justifiable process.

We have also established a grievance process to ensure that student grievances will be investigated fully and fairly, treated confidentially and decisions rendered in a timely manner. In general, these issues are best moderated internally. With an effective oversight/grievance committee structure, few grievances or disputes will reach the stage where they require formal resolution. However, when program and informal resolution is not feasible or successful, the graduate office is the next place to turn. When grievances can not be resolved by speaking directly to the person who bears responsibility for the complaint or who is the alleged cause of the complaint, then the student should discuss the issue with the next closest individual with whom they feel comfortable in addressing their concern.

1. Speak to the graduate advisor

2. Speak to other members of the Thesis Advisory Committee, or to the appropriate Graduate Education Committee or the PEMM Graduate Committee

3. Speak to the Director of the theme, the Department Chair, and/or the Director of PEMM.

4. If a satisfactory resolution can not be reached within the Program, the aggrieved student may request a meeting with the Dean of Graduate Studies to discuss the issue.

5. If the Dean, working together with the aggrieved student and appropriate faculty member(s), or representatives of the graduate program is unable to reach a satisfactory resolution, the student can request in writing a formal hearing and ruling by the Dean of Graduate Studies and the Committee on Student Grievances. Formal hearings are conducted as described in the Graduate Handbook (see sections titled “Committee on Student Grievances” and “Formal Hearing” under Academic and Conduct Regulations).

Please note that allegations of scientific misconduct, violations of the academic honor principle, and certain issues of professional and personal conduct (sexual harassment, discrimination, and others described in the graduate handbook under code of conduct – non-academic regulations) must be reported to and handled by the Graduate Office.
Appendix I

Guidelines for writing a rotation report

Writing a rotation report is an important exercise in learning how to write a paper. Before you begin to write, get a few papers related to your topic from good journals that use a format similar to what a lab report should be. Examples would be Cell, JBC, Genes and Development, Cancer Research and Molecular and Cellular Biology (MCB). Short-form journals such as Science or Nature would not be appropriate. See how these experienced authors present their work and try to present your work in a similar fashion. For example - read their Introduction or a sub-section in their Results section and then try to pattern your sections after theirs.

Abstract
In 250 words or less (this is usually a real challenge)…
Describe the major question you are trying to answer or problem you are trying to solve.
Describe why it is important.
Describe your experimental approach to the problem.
Describe your major result(s)
Describe your major conclusion(s) from the results.

Introduction
Here you should give the background of your project.

Give the history of the problem you are working on to put your work in context. How does it fit into the larger picture of the system you are working in (i.e., role of metalloproteinases in tumor metastasis, initiation of apoptosis by Fas ligand, development of more efficient retroviral vectors, etc.)

Describe previous results from other labs and yours.

Make sure you explain why your question, system and approaches are unique and important. Make your work sound interesting. Make the reader want to read on to find out how you solved your problem or tested your hypothesis. If you can’t be excited about your work then other people are unlikely to be.

Describe the system you are using and why it is appropriate for your work.

Results should not be presented in the introduction section although many papers will frequently conclude with a brief statement of what was discovered.

Methods
Succinctly detail the source of materials and the specific methods used. Do not reiterate established methodology, but reference appropriate sources that would provide this detail.
Results
In this section you are essentially telling the story of how you attacked a problem. It should be
written to logically guide the reader step by step through your research. Each step should make
sense to the reader.

You should have a separate section for each experiment or closely related set of experiments you
do.

Each of these should address (and hopefully answer) a specific question or test a specific
hypothesis.

Each section should have a specific title (i.e., Proteins binding to the HSFE or Cloning of gene X
or Effect of the 3’ enhancer of gene expression, etc.)

Each section should contain
1. An explicit statement of the problem or hypothesis to be tested (i.e., In this experiment
   we tested the hypothesis that …).
2. A statement of the rationale for your experiment(s) - explain why it is important.
3. A specific description of the experimental approach you used (this differs from the
   methods).
4. Description of the results of your experiment. Verbally walk the reader through your
   results, step by step. This often amounts to describing a gel or other figure. Be sure to
   note the importance and appropriateness of the controls you used.
5. Conclusion - Briefly state how the results of the experiments relate to your original
   hypothesis or the problem you were trying to address. Have you tested it successfully?
   What is the outcome of your testing?

The next section should describe the next logical step in your approach to your overall
problem. It usually builds on, or follows from, the results of the previous section.

Figures need an explanatory legend, but a good figure can usually be understood simply from
looking at the figure if it is appropriately labeled. Cite each figure in the text as Fig. 1, 2, etc.

Discussion
Here you should begin by very briefly (once again) stating the overall goal of your research.

Then pick your most significant and interesting results to highlight and discuss how they are
relevant to research in your chosen system as well as beyond the focused scope of your paper.

Each major discussion point will often have its own sub-heading (if there are enough points that
need to be discriminated)

For a rotation report you should discuss what the next logical steps in the research would be. If
you ran into problems, how would you try to get around them if you were continuing on with the
project.
The last paragraph is usually makes a rather grand statement on the relevance and importance of the work.

References
Cite references in appropriate places throughout the report, and list them at the end.

Use a consistent reference style based on a journal format that you choose. A format that includes the title of the article is generally most informative.

References generally include authors, title, Journal, volume, first and last page and year (not always in that order). They rarely include the issue number, month or day of publication.

Length
A rotation report can be concise. We are not looking for a thesis, but a focused and brief report. A typical length might be 5 - 10 pages excluding figures and references.
Appendix II

Specific instructions for student grant applications.

1. Write the grant application using the NRSA format (no front pages). This is a 7 page application not including references. Examples of grant applications will be made available in the PEMM office.

2. An NRSA application should propose 3 years of post-doctoral work for yourself at full time effort.

3. Present a testable hypothesis and plan a series of experiments to test it. Justify it as much as possible. Note that a hypothesis does not have to be true; the grant is designed to determine whether it is true. Even if the hypothesis is eventually disproved, the grant should still be able to produce valuable data and future research.

4. The introduction should provide adequate background to justify the hypothesis. An introduction that addresses only the area of research but fails to build up to the hypothesis is inappropriate.

5. Each aim should represent a series of experiments, not single experiments. A series of experiments means that after your initial experiments, you should discuss the possible outcomes, and propose experiments based on these outcomes. Discuss the potential results of the subsequent experiments as well. Note the pitfalls, and solutions. Discuss alternative hypotheses.

6. Do not base your application on a single initial experiment. A potentially lethal flaw in a proposal results if the first experiments are not possible, and the remainder of the proposal is predicated on the success or specific outcome of the first experiments.

7. Focus most of the experimental section on presentation of the experimental design. Do not go into extensive details of established methodology; a brief comment to confirm that you understand the methods is adequate as long as a reference is provided.

8. Assume that all the necessary resources and equipment will be available to you.

9. When antibodies, cell lines, plasmids etc. are required, assume that if they have been published, they will be provided to you by the authors of that paper. Make sure you cite the source.

10. Discuss the long-range direction of the research program. What future studies might you perform based upon success of the current application?

11. A fundable grant is one that has the greatest probability of generating a significant advance. Reviewers are asked to score significance and innovation. Be sure to demonstrate that your proposal will have a significant impact on human health.