

UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE

GRADUATE PROGRAM IN MOLECULAR
VIROLOGY AND MICROBIOLOGY "MVM"

FACULTY / STUDENT HANDBOOK

2012-2013 EDITION

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A. INTRODUCTION

The Molecular Virology and Microbiology (MVM) Program is a component of the Interdisciplinary Biomedical Graduate Program (IBGP) in the School of Medicine. Comprehensive and diverse resources including courses, seminars and research training are designed to provide a stimulating and supportive environment for the education of independent scientists at the PhD level. Our goal is to train Doctorates who will make significant contributions to the fields of virology and microbiology. Areas of study include how microbial pathogens (viruses, bacteria and parasites) cause disease. This includes areas such as basic replication processes, host-pathogen interactions, the design of innovative strategies for the prevention and treatment of infectious diseases, and the utilization of unique features of these organisms in clinical medicine and biotechnology (e.g., gene therapy, antivirals or antimicrobials). A special feature of this graduate program is an emphasis on promoting the relationship between basic and clinical disease. The graduate training faculty of the Molecular Virology and Microbiology program consists of over 40 faculty members with primary appointments in the Departments of Microbiology and Molecular Genetics, Infectious Diseases and Microbiology, Medicine, Pathology, Ophthalmology and Obstetrics, Gynecology & Reproductive Sciences.

B. ORGANIZATION OF THE INTERDISCIPLINARY BIOMEDICAL GRADUATE PROGRAM (www.gradbiomed.pitt.edu/programs_dir.aspx)

B.1 Office of the Dean

Associate Dean of Graduate Studies: Dr. John Horn, PhD

B.2 Graduate Council:

University Committee consisting of the Associate Dean of Graduate Studies, each Graduate Program Director, Director of the MD/PhD Program and one student representative.

B.3 Graduate School Committees:

Admissions Committee
Curriculum Committee

Recruitment Committee
IBGP Steering Committee

B.4 Graduate Programs:

Cell Biology and Physiology

Director: Dr. Donna Stolz, PhD

Cellular and Molecular Pathology

Director: Dr. Wendy M. Mars, PhD

Immunology

Director: Dr. Lawrence Kane, PhD

Molecular Genetics & Developmental Biology

Director: Dr. Neil A. Hukriede, PhD

Molecular Virology and Microbiology

Director: Dr. Neal A. DeLuca, PhD

Molecular Pharmacology

Director: Patrick Pagano, PhD

B.5 Biomedical Graduate Student Association

B.6 MVM Program Committees:

Steering Committee
Comprehensive Exam Committee
Evaluations Committee

Recruitment Representative
Curriculum Committee
Executive Committee

C. GRADUATE DEGREE REQUIREMENTS

C.1 Requirements for a PhD

The Interdisciplinary Biomedical Graduate Program is comprised of formal course work and original laboratory research, which is designed to allow attainment of a PhD in 4-6 years. The University requires students seeking the PhD degree to engage in a minimum of one term of full-time doctoral study, which excludes any other employment except as approved by their departments. The PhD degree work must include satisfactory performance in the Core Foundations of Biomedical Knowledge course and subsequent course work (see section F.1) including a research dissertation. All work must be completed within a period of 10 years from the student's initial registration; if the student has received credit for a master's degree appropriate to the field of study, all requirements for the PhD degree must be completed within eight years.

A minimum of 72 credits is required to obtain a PhD degree. Of these, 32 credits must come from MVM approved courses, not including lab rotations or dissertation research; a maximum of two credits each (total of 6) are required from the MVM research seminar, the contemporary topics course, and the microbiology teaching assistantship. Student performance in these courses will be evaluated and graded using a satisfactory (S) or unsatisfactory (U) scale. For all other courses an A-F letter grading system will be employed. An "I" (incomplete) grade must be made up according to the stipulations of the faculty director of the course, Program Director, and University policy.

It is strongly recommended that graduate students not fluent in English take a University Course in conversational English, to allow active and full participation in the program. This course does not have to be taken for credit, nor does it contribute to the student's Quality Grade Point Average (QPA). If indicated by the Michigan Test scores and by the Office of International Services, students are required to register for conversational English courses to overcome language deficiencies.

University policy dictates that all students have a cumulative QPA of at least 3.0 at graduation. The MVM program requires that students obtain a minimum grade of B in all graduate courses and maintain a minimum 3.0 QPA during their PhD studies. If a student fails to maintain the minimum grade requirement, the MVM faculty will decide whether to dismiss the student from the program or to allow the student to retake any course for which a grade less than a B was received. Such students will be placed on probation, and will receive tuition remission, but a stipend is not guaranteed.

C.2 Requirements for a Masters Degree

Students are not admitted to the MVM graduate program to attain a M.S. degree. In certain cases, however, it may be necessary that a student in the PhD program be transferred to terminal M.S. degree. Students pursuing a M.S. degree in MVM will be required to complete the same course work as described for the PhD program and to prepare and successfully defend a Masters Thesis. A committee of 3 faculty members is required to approve the thesis. No formal public defense is required, although the 3 faculty members may request an opportunity to question the student.

D. THE FIRST YEAR OF THE INTERDISCIPLINARY BIOMEDICAL GRADUATE PROGRAM

All students admitted to the PhD program in the School of Medicine join the Interdisciplinary Biomedical Graduate Program (IBGP). The IBGP facilitates matching students with their areas of research interest and oversees their timely matriculation of students at the University of Pittsburgh School of Medicine. The IBGP Steering Committee, composed of the director of each program and the Associate Dean of Graduate Studies, governs the activities of the IBGP. The IBGP Steering Committee supervises the first-year curriculum, oversee student research rotations, and evaluate students until they join one of the specialized programs at the end of their first year. There are sub-committees responsible for directing admissions, recruitment, and curriculum.

The key elements of the IBGP are advising and evaluation, curriculum, research, and facilitating the process of transferring into a specialized program. The responsibilities of committees overseeing these elements are described briefly below.

D.1 Advising and Evaluation

After students are admitted to the IBGP they are assigned a first year mentor. The mentor will provide advice on research and academic requirements and choices and assist in the student's decision to enter a specialized program. The mentor also will represent the student's interests by communicating with program directors or the Associate Dean prior to or at meetings of the IBGP Steering committee should there be concerns about academic progress. The first year mentor's role officially terminates when student moves from the IBGP to a specialized program and chooses a thesis advisor.

First year students will be continually evaluated by the IBGP Steering committee for grade point average and for satisfactory progress in their research rotations. The committee is responsible for a preliminary evaluation at the end of the first year. Students will be assessed based on coursework and laboratory rotations. Successful completion of the preliminary evaluation allows students to transfer into a specialized program. If a student is performing at an unsatisfactory level, remedial action may be required at the request of the committee, or the student may be dismissed from the program.

D.2 Curriculum

The Foundations of Biomedical Science is the IBGP core course, which is required of all first year IBGP students. It meets for two hours per morning, four days per week, in the fall semester, and is supplemented by small group sessions twice a week in the afternoons. This course is designed to provide an overview of the fundamental elements of contemporary biomedical science that should be common to all students, regardless of their interests. A two credit hour course in statistics, offered in the summer at the end of the first year, is also required. Finally, all students are required to take a 1 credit hour ethics course.

After the fall semester there is considerably more flexibility in the choice of classes. Each program offers one or more classes in the spring semester; these classes are scheduled to allow for a minimum of course overlap and to maximize the time that a student has to pursue their laboratory rotation research. Students should choose spring semester classes based on their own interests and the requirements of the programs they anticipate joining. For MVM

students, two courses (two credit hours each) are required: Molecular Virology (MSMVM 2410) and Microbial Pathogenesis (MSMVM 3410).

An optional companion course (one credit hour), Experimental Virology can be taken during this semester. Elective courses from MVM or other programs can be taken as well in the first Spring semester, providing the requirements for those courses are met. Consultation with the first year mentor is required prior to enrolling in classes for the spring semester. There is a wide range of graduate courses offered by the various programs in the School of Medicine. The most current list of courses is available from the web site: <http://www.gradbiomed.pitt.edu/pitt>.

In unusual cases, a student's educational background may preclude the need to take one or more of the courses offered by the IBGP. In this situation, the student should meet with the appropriate course director and the MVM program director who may recommend that requirements be waived or that the student take an exam to place out of the course.

If a student fails to achieve a grade of B or higher in any course, the course must be repeated. Make-up exams may be offered at the discretion of the course director. Students concerned about performance in a course should discuss this with the course director at the earliest opportunity. If after this discussion the student is not satisfied with their grade, a meeting between the student, course director, and MVM program director will be convened. A report of this meeting will be forwarded to the Associate Dean of Graduate Studies who will render a final action on the matter.

D.3 Research

Laboratory research is the major component of any biomedical PhD program. The IBGP supervises the process of research rotations during the first year. Students are expected to complete three research rotations during the first year. At the end of each rotation, the student is required to complete a written report that is prepared according to the style suggested for contributors to the Journal of Biological Chemistry. When the written report is complete, the rotation mentor will review the performance of the student and assign a letter grade for the rotation. Failure to maintain satisfactory laboratory performance will result in dismissal from the program.

It is generally expected that the three rotations will be performed in different laboratories of members of the IBGP training faculty. This will provide the student with an adequate opportunity to identify an area of research interest and to establish a relationship with a potential dissertation advisor. It is possible for students to take a fourth rotation if necessary. There are several circumstances where the requirement for three different laboratory rotations might be relaxed. For example, if a student has completed a Masters thesis based on original research, a report of this project may be submitted in place of a rotation report upon approval by the Associate Dean. Alternatively, students may want to do a second rotation in the same laboratory if they have already identified a dissertation advisor, or may even want to rotate in a laboratory outside of the IBGP. Requests to modify the rotation requirements should be made, in writing, to the IBGP committee and will be considered on an individual basis.

D.4 Graduate Student Stipends

All graduate students receive a standard monthly stipend provided by the School of Medicine for the first year. After that, the Dissertation Advisor is responsible for the stipend. The School of Medicine and the Advisor also cover graduate school tuition. If you have any questions about the IBGP or any of the procedures described above you should direct them to the MVM program director, your mentor, or the Graduate Office, 524 Scaife Hall (648-8957).

E. TRANSFERRING FROM THE IBGP TO THE MVM PROGRAM

At the end of the first year, students will undergo the preliminary evaluation by the IBGP Steering Committee and, on successful completion, will transfer into one of the specialized degree granting programs. The choice of program is likely to be dictated by the choice of dissertation advisor. The process of moving into the MVM program should occur as follows:

1. Identify a potential MVM dissertation advisor. This decision is based on rotation experiences, particular research interests, exposure to faculty during classes and talking with other graduate students.
2. Receive permission from the potential dissertation advisor to join the laboratory. Most of the training faculty will welcome students into their laboratories. However, certain circumstances such as funding restrictions or time commitments may prevent a student from joining the lab of choice. If this is the case, that advisor may be helpful in directing the student to a laboratory with similar research interests.
3. Identify the appropriate program. Many of the training faculty have appointments in two programs, so a student may choose the program that best fits his/her interests.
4. Petition the Program Director in writing for admission into that program. The Program Director will determine whether you have met the course requirements for the program, or may suggest second year classes to take. Students may want to meet with program directors of programs in which they are interested near the end of the first semester to determine which classes are recommended for the second semester.
5. Obtain the appropriate form for transfer into the program from the Graduate Office, have it signed by the Program Director and return it to the Graduate Office for the signature of the Associate Dean.

F. CURRICULUM FOR MVM GRADUATE STUDENTS

F.1 MVM Program Course Requirements

COURSE TITLE	CREDITS
Foundations of Biomedical Sciences	8
Foundations Conference	4
Ethics	1
Microbiology Teaching Assistant*	2 (maximum)
Biostatistics	2
Molecular Virology	2
Microbial Pathogenesis	2
MVM Research Seminar+	4 (maximum)
Approved Electives (3-4 courses)	7 (or more)
TOTAL CREDITS	32 (or more)

* Students in years 2-4 must participate in this teaching requirement every spring semester with a maximum of 2 credits from each counting towards the 32 credit minimum requirement of formal course work.

+ Students must register for this seminar every semester with a maximum of 4 credits from each counting towards the 32 credit minimum requirement of formal course work.

F.2 MVM Course Offerings:

REQUIRED

MSMVM 2400 MS Thesis Research (1-14 cr) A directed research project leading to a thesis for a Master's degree. All semesters.

MSMVM 2410 Molecular Virology (2 cr) This course stresses basic concepts of animal virology. Subjects include virus structure, attachment and entry, mechanism of regulation at the RNA and protein levels, viral nucleic acid replication, viral assembly and egress, and expression and regulation of viral genes, antivirals and viral immune evasion. Lecture format. Foundations of Biomedical Sciences, or an equivalent course (approved by Course Director) is a prerequisite. Spring semesters. (Homa)

MSMVM 2430 Microbiology Teaching Assistant (1 cr) The purpose of this course is to introduce graduate students of the Interdisciplinary Biomedical Graduate Program to the principles of teaching. The students will be trained in basic teaching techniques as well as provided material for teaching students specific concepts. As part of this course, students will participate in teaching first-year medical students the fundamentals of microbiology, in conjunction with the Laboratory and Problem Based Learning sections of the Molecular Pathogenesis of Infectious Disease course of Basic Science Medical School block. Each student will be responsible for 8-10 medical students in a laboratory setting. The student will present basic laboratory techniques, explain concepts of microbiology and infectious

disease, including diagnostic tests, interpretation of results, and data management. In addition, the student will assist the Faculty Facilitator in the Problem Based Learning Sessions where they will review laboratory findings with the students. Spring semesters. (Coyne)

MSMVM 2450 Research Seminar (1 cr) Each class is divided into a Research report and a Paper discussion designed to develop skills needed for scientific presentation. The student research progress report details the background, reasoning, analyses, critical evaluation of experimental strategies, data analysis and interpretation of their experimental results. Students are expected to discuss issues and answer questions from other graduate students and faculty. The research paper discussion is designed to teach students to critically evaluate and present published data in contemporary scientific research articles. Students, in consultation with the course director, select published articles for presentation and discussion. Restricted to MVM graduate students or by special permission of instructor. Fall and Spring semesters. (DeLuca and Kinchington)

MSMVM 2490 Directed Study (1- 9 cr) This course provides the student an opportunity to carry out a specific laboratory project in any area of interest in MVM. All semesters.

MSMVM 3400 PhD Dissertation Research (1 – 14 cr) After advancement to candidacy for the PhD degree, students enroll in this course to pursue original experimental laboratory research, the results of which will provide the substance of their doctoral dissertation. A minimum of 40 credits of this course is required for the PhD degree in the School of Medicine. All semesters.

MSMVM 3410 Microbial Pathogenesis (2 cr) This course is an introduction to molecular basis of bacterial and parasitic pathogenesis. Topics include microbial physiology and genetics, gene expression, virulence factors, pathogenic strategies of bacterial agents. Lecture format. Foundations of Biomedical Sciences, or an equivalent course (approved by Course Director) is a prerequisite. Spring semesters. (Flynn)

ADVANCED TOPICS AND ELECTIVE COURSES

MSMVM 2420 Advanced Topics: Experimental Virology (1 cr) This course is designed to teach students in graduate research projects how to critically evaluate the scientific literature in terms of multiple different viruses, experimental strategies, interpretation of data and the basis of conclusions made in published articles. Paper discussion in small group format. Completion or concurrent registration in Molecular Virology (or equivalent) required. May be taken only one time for credit. Spring semesters. (Kinchington)

MSMVM 3420 Advance Topics: Viral Pathogenesis (2 cr) This course provides lectures in a particular virus that expand the basic biology of the virus life cycle to the level of virus-host interactions. Pathogenic properties of select viruses are outlined from the perspective of disease manifestations, immunology, and the natural history of infection. Lectures will also address the molecular basis of viral pathogenesis and current advances in therapeutic strategies. Lecture/paper discussion format. Molecular Virology (or equivalent) required. Fall semesters. (Gupta)

MSMVM 3435 Advance Topics: Tumor Virology (2 cr) This course introduces students to

viruses known or suspected of causing tumors, with special emphasis on viruses causally linked to human cancer, including polyomaviruses, Epstein-Barr virus, Kaposi's sarcoma-associated herpesvirus, adenoviruses, papillomaviruses, hepatitis viruses, human T-cell lymphotropic virus. Topics focus on establishing causality between specific virus infections and cancer, oncogenes, tumor suppressors, oncogenic cofactors, disruption of innate/adaptive immune responses, latency, viral mimicry/piracy of cellular regulatory genes, genomic instability and role of non-coding RNAs in viral pathogenesis. Alternate semesters.

MSMVM 3440 Advance Topics: Vaccines and Immunity (2 cr) The purpose of this course is to (1) explore the history of vaccines; (2) underscore the successful role of current vaccines in the management of infectious diseases; (3) present strategies for a new generation of safe and effective molecular vaccines; and (4) discuss the ethical and economic realities of vaccine use and development. Alternate Spring semesters.

MSMVM 3455 Advance Topics: Antimicrobial Therapeutics (2 cr) The course will provide detailed information at the molecular level describing the development and mechanism of action of antimicrobial drugs. Topics to be discussed include anti-bacterial, anti-fungal, anti-parasitic, and anti-viral (including anti-retroviral) agents. Some emphasis will be placed on diseases with significant public health impact. The course will encompass aspects of medicinal chemistry, biochemistry, and molecular biology. Alternate Fall semesters. (Parniak)

MSMVM 3475 Advanced Topics: Imaging Host-Pathogen Interactions (1 cr) This course will provide an introduction to fluorescence microscopy with an emphasis on the study of host-pathogen interactions. Experts in the fields of bacterial pathogenesis, viral entry, viral protein signaling, fungal pathogenesis, polymicrobial infections will present lectures on the use of imaging in their fields of research, give demonstrations of various imaging techniques and lead a journal club discussion of relevant papers from the literature. The goal is to provide students with a basic understanding of fluorescence microscopy for the purpose of properly designing their own experiments and effectively evaluating the work of others. Summer course (Bomberger)

MSMVM 3480 Advanced Topics: Immunology of Infectious Diseases (2 cr) This course examines the immune responses to pathogens, as well as on immune evasion of microbes. The organisms studied include bacteria, parasites, and viruses. Topics focus on host-pathogen interaction and include innate immunity, modulation of antigen processing and presentation, pathogenic strategies for subversion of immune responses, effector functions of immune cells, and immunopathology. Graduate level immunology is a prerequisite. Lecture/paper discussion format. Fall semesters. (Flynn/Norris)

The following are policies regarding registration for and participation in the Monday noon Research Seminar course (MSMVM 2450) required of all Molecular Virology and Microbiology students.

1. Students will register for this course in the 2nd, 3rd and 4th years of graduate school.
2. In the 5th year of graduate school, MVM students will NOT register for these courses, instead registering for full time dissertation research. However, 5th year students are required to attend the course on a regular basis. Failure to do so will be noted on the Annual Progress Report.

3. For the Research portion of the course, 5th year students (and beyond) will be expected to present their research once per year as usual. This is important in preparing for thesis defense and as an example to the more junior students.
4. For the Paper discussion portion of the course, 5th year students (and beyond) may be excused from presenting a paper each semester, provided enrollment in the course is sufficient to cover the presentations each week. However, participation in discussion of the paper is still expected, as the wisdom and experience of the more senior students in an important component of the course.
5. Student will be excused from this course during the final semester in which a student is actually writing his or her dissertation and planning to defend the thesis.

F.3 Seminars and Research in Progress

MVM graduate students enroll each Fall and Spring semester in the Research Seminar (MSMVM 2450) on Mondays at noon.

A number of other seminar series are offered on a regular basis by departments (Microbiology and Molecular Genetics, Infectious Diseases and Microbiology, etc.) and other specialized research programs (Immunology, Center for Vaccine Research, etc.). MVM graduate students are encouraged to attend presentations that are relevant to their graduate training and research interests.

F.4 Teaching requirements

The MVM program provides teaching experience as an integral part of the training of each graduate student. The Program's philosophy is that effective graduate training should be comprehensive, and include formal coursework, independent research and teaching experience. This curriculum best prepares students for careers in academia and industry where one is often involved in formal or informal teaching duties. Acting as teaching fellows in various graduate or medical school courses fulfills the teaching requirements. Students in years 2-4 of the program will be required to act as teaching assistants in the Molecular Pathogenesis of Infectious Disease laboratory course. It is estimated that this requirement will occupy the student for one month out of the year (typically in March). Credit will be given for participation as a teaching assistant (one credit per course) and this participation will be reflected on the student's academic transcript. A maximum of two credits will count toward the student's total MVM requirements. Students will be evaluated on their performance as a teaching assistant as satisfactory (S) or unsatisfactory (U). Generally, graduate students will not be required to teach during the academic year that they plan to defend their dissertation. Students planning to defend their dissertation should notify the Program Director in writing and the dissertation advisor must co-sign the letter. No other exemptions from teaching will be granted.

F.5 Evaluation of students in the MVM program

In the first year, prior to joining a specific program, the IBGP Steering committee evaluates students. Upon joining the MVM program, the student will be evaluated by the MVM Evaluations Committee. This committee will conduct an annual comprehensive evaluation

of each student in the program to ensure that MVM students maintain steady progress towards graduation. This committee is composed of MVM faculty.

Content/Process of the Annual Student Evaluation Each student will be evaluated in the following areas:

- i) Academic performance,
- ii) Progress towards completion of required coursework,
- iii) Participation in required MVM activities (e.g. journal clubs, seminars and teaching),
- iv) Research performance (this will be largely based upon a written evaluation provided by each student's advisor),
- v) Whether each student is holding regularly scheduled thesis committee meetings in accordance with MVM guidelines,
- vi) Student self-appraisal.

Evaluations will be held in May. Several weeks before the Evaluations Committee meets, a brief (~1 page) written appraisal of each student's research progress will be solicited from the advisor and a brief written self-appraisal and an updated, properly formatted, Curriculum Vitae will be solicited from each student. This self-appraisal should describe the student's accomplishments during the previous year, along with a brief description of future plans. These letters, along with the student's academic record, completion of coursework, participation in required MVM activities and promptness in holding thesis committee meetings, will be considered by the Evaluations Committee. A written evaluation will then be prepared for each student (see attached form), and a copy of this evaluation report will be sent to each student and to the advisor, as well as placed in the personnel file of the student, and sent to the Graduate Studies Office.

If the Evaluations Committee identifies a significant deficiency, the student will receive an unsatisfactory rating. Specific recommendations within a designated time frame will be given. Failure to remedy the unsatisfactory areas may result in dismissal from the program.

Molecular Virology and Microbiology Evaluations Committee

ANNUAL STUDENT EVALUATION FORM

Student: _____ Degree Sought: _____
Advisor: _____ Evaluation Date: _____

1) Academic standing (circle one): Satisfactory Unsatisfactory

a) Date entered graduate program: _____

b) Comprehensive Exam (date passed): _____

- c) Comments:
- 2) Coursework:
- a) Post-first year courses successfully completed?
- b) Comments:
- 3) Participation in Other Required MVM Activities: Satisfactory Unsatisfactory
 (teaching, journal club, seminars, etc.)
- a) Comments:
- 4) Research progress: Satisfactory Unsatisfactory
 (append advisor's research appraisal)
- a) Comments:
- 5) Thesis Committee Meetings (if relevant)
- a) Date committee formed:
- b) Date of last committee meeting:
- c) Comments:
- Overall Evaluation: (circle one): Excellent Satisfactory Unsatisfactory
- Recommendations (if any):
- Signature of Evaluation Committee Representative:

G. COMPREHENSIVE EXAMINATION

G.1 Eligibility

Students enrolled in the PhD program must take the Comprehensive Examination within one year after passing the Preliminary Evaluation. The Comprehensive Examination will be administered after the student has completed his/her course work, has decided on the general area of thesis research and has chosen a major advisor. All students must maintain a cumulative QPA of 3.00 to be eligible to take the exam.

G.2 Timeline

A letter will be sent by April 1 to notify each eligible student of the requirement for taking the comprehensive examination. An abstract of the student's thesis proposal is due 2 weeks after this letter is received and should be emailed to Frank J. Jenkins, PhD at

fjenkins@pitt.edu. All abstracts are to be sent as Word or PDF documents. This abstract aids in the formation of an examination committee for the student. The written proposal, based on the student's research, is due approximately 45 days after the letter is received with a specific due date stated in the letter. This also should be emailed to Dr. Jenkins. The proposals are to be sent as PDF files. An oral defense of the proposal will take place within 2-4 weeks of the submission of the proposal. The exact deadline dates for abstracts and proposals are detailed in the letter sent to each second year student in April.

G.3 Abstract and Written Proposal

The Comprehensive Examination is based on the student's thesis research proposal. The examination will require that the student complete a research proposal with the following guidelines rigorously adhered to:

An abstract of not more than one page should detail the hypotheses of the thesis research and outline general methods that will be used to achieve the goals of the proposal.

The thesis proposal submitted prior to the exam should be in the form of a grant proposal that is conceptually well founded and adequately documented. Attribution to published and unpublished sources must be comprehensive. The written proposal must be original to the student, although the project may have been previously outlined in the advisor's grant. The proposal is to be well organized, written in a coherent, grammatically correct style, and should describe original and innovative experiments that will accomplish the stated aims and objectives of the research. NIH instructions for format should be followed except as amended by department guidelines (see below). The entire proposal must not contain more than 6 pages (excluding title page, abstract and references) of single space type and one-inch margins on all sides. The typeface must be Arial or Helvetica with a font size of 11 or greater. Any figures must be included in the 12 page limit.

The written proposal cannot consist of merely a collection of experiments, but must include well-defined hypotheses and rationale as well as the significance of the proposed experiments. How the expected results will benefit the field of research also should be discussed. Students shall take no more than four weeks from their laboratory work in the writing of their Comprehensive Examination proposal. The student is responsible for preparing an original research proposal. Dissertation advisors and others may be consulted on specific scientific issues, but the document must be prepared exclusively by the student. Advisors may not edit the proposal for style or content.

The written research proposal will adhere to the following organization and page guidelines:

- i) Title Page.
- ii) Abstract page (as submitted to Examinations Committee Chair)
- iii) Specific Aims - not to exceed one page.
- iv) Significance
- v) Innovation

- vi) Approach
- vii) Literature Cited - must include complete citation with all authors, year, title, journal, volume, inclusive pages. References should be limited to relevant and current literature that is pertinent to the proposed research

Preliminary data is not required in the proposal, but if available, it can be incorporated into the Approach section of the proposal.

Upon completion, 4 copies of the proposal shall be submitted to the Examinations Committee chairperson by 5:00 P.M. of the due date. Examination proposals submitted after the deadline must be accompanied by a letter from the student that states the reasons for late submission and a justification for acceptance of the proposal. The Examinations Committee will review all cases of late submission and inform the student within five working days whether the examination proposal has been approved for submission to the Examinations Panel.

G.4 Assessment of Written Proposal

The Examinations Committee will establish for each student's proposal a panel of faculty members (and its chairperson) competent to evaluate the subject of the research proposal. The Examinations Committee chairperson will distribute copies of the student's proposal to members of the selected panel within one week after the submission date. Each panel shall consist of three members, at least two of who are members of the Molecular Virology and Microbiology Graduate Program of the department. The student's Thesis Advisor shall not serve on the panel. It will be the responsibility of the panel chairperson to poll panel members as to the acceptability of the written proposal, and, if acceptable as submitted, to convene the panel for an oral examination. If a majority of the panel find the written proposal unacceptable, the panel chairperson shall notify immediately the Examination Committee chairperson, who shall convene a meeting of the panel with or without the student in attendance to review the reasons why the proposal was deemed unacceptable. An unacceptable proposal shall constitute failure of the Comprehensive Exam in the absence of an oral exam. The chairperson of the Comprehensive Examination panel shall submit to the Examinations Committee chairperson a written evaluation of the proposal and reasons for failure. The Examination Committee chairperson shall have the responsibility to forward copies of the critique to the director of the graduate program, the student and the student's mentor.

G.5 Oral Examination

Presuming an acceptable written proposal, the oral examination for each student will be scheduled as soon as feasible after completion and submission of the written proposal (preferably within three weeks).

At the beginning of an oral examination, and in the absence of the student, the Examinations Committee chairperson (or a person designated by him/her) will briefly address the committee, communicating the ground rules for the examination. The student will begin the examination with an oral presentation (not to exceed 15 minutes) of the research proposal.

The examination shall not exceed two hours, inclusive of the student's opening presentation. The research proposal shall be the sole document available to the student during the oral examination. No other visual aids, such as overheads or slides, are allowed.

It will be the panel's task to evaluate the student's understanding of both the content of the research proposal and the basic concepts underlying the proposal. Although the research proposal serves as the basis for testing the student, the panel will question the student about subjects related to the proposal. Thus, the student must be prepared to discuss any aspect of the proposal and underlying principles, including current literature, techniques, related systems, alternative approaches, etc.

At the end of the oral examination, the panel will vote in private to pass or fail the student. A simple majority shall prevail; abstentions will not be permitted. There shall be no conditional pass/fail decision. After the panel vote, the panel chair will immediately notify the student of the decision and give an evaluation of performance. The Chairperson of the panel shall also notify the Examination Committee Chairperson of their decision, immediately following the exam. A critique written by the panel chairperson, evaluating the exam process and the pass/fail decision shall be submitted to the chairperson of the Examination Committee who shall distribute copies to the director of the graduate program, the student and the student's mentor. In this critique, the chairperson may suggest areas of weakness for the student that could be addressed.

A "pass" shall be warranted when both of the following conditions are met: (i) the written proposal is considered acceptable as presented, and (ii) the student has performed knowledgeably in defense of the proposal.

In the event of a failure, the student shall be given one opportunity to retake the Comprehensive Examination provided that the modified written proposal is submitted within four months after notification of failure of the first exam. In the case of re-examination, the committee will consist of three faculty, one of whom may be from outside the Molecular Virology and Microbiology Graduate Faculty. One member from the original panel of examiners will also serve on the second panel. In the event of a second failure, the action of the faculty shall be dismissal of the student from the program or recommendation that the student transfer to the M.S. degree program for the completion of his/her training.

H. ADVANCEMENT TO CANDIDACY AND FORMATION OF DISSERTATION COMMITTEE

Following completion of course work and passing the comprehensive examination, the MVM faculty votes to advance each student to candidacy for Doctoral degree (PhD). The following process should occur at this time:

1. Students should form a dissertation committee within three weeks of passing their Comprehensive Examination. The committee shall consist of at least five faculty members. The Dissertation Advisor is included in the committee and may act as Chair, although another faculty member may also be designated Chair of the committee. At least three members must be from the MVM program faculty, and at least one member must be from outside the MVM program. The student is not limited to faculty from the School of Medicine, or even to this university. The Director of the MVM program will review the

committee, sign the necessary forms and forward the completed documents to the Graduate Office. Final approval of committee membership rests in the hands of the Associate Dean for Graduate Studies. The student must send the chairman of the committee a letter when the committee has been formed so this information can be included in the Evaluations Committee files. This letter should include the date the committee was formed and the membership of the committee.

2. The thesis committee should meet within three months of formation, and must meet within the first 6 months after a student passes his/her comprehensive exam. Prior to the meeting, a written thesis proposal should be provided to each committee member. At the first meeting, the dissertation research project is presented in detail to the committee. At this initial thesis committee meeting, the student should make certain that all required graduate school forms are complete.
3. Every time a thesis committee meets (including the first meeting), a brief report of this meeting, signed by both student and advisor, must be sent to the Chair of the Evaluations Committee so this information can be included in the Evaluation Committee files, and the Graduate Studies Office. It is also helpful to submit a report to each committee member.
4. Following the initial thesis committee meeting, additional meetings must be held at six-month intervals. Failure to schedule and hold meetings every 6 months can result in an unsatisfactory annual evaluation. The student must submit one week prior to the scheduled committee meeting a brief written summary of their research progress since the previous committee meeting.

I. DISSERTATION AND FINAL ORAL EXAMINATION

The student's dissertation must provide evidence of original scholarly research of sufficient quality to be published in a leading scientific journal. Laboratory work for which a student receives wages (for example, work performed when the student was employed as a technician) is not eligible for any part of the dissertation research. The student's dissertation committee will meet at the time that the student's research is nearly complete and will authorize the student to begin writing the dissertation. The style and format of the dissertation must conform to the standards set forth by the Graduate Council. The dissertation advisor and one or more members of the dissertation committee will read preliminary drafts of the dissertation and will approve the final copy for submission to the dissertation committee. The final copy must be submitted to the dissertation committee at least two weeks prior to the dissertation defense date.

The dissertation defense consists of a formal, public seminar on the subject of the dissertation. This is followed by an examination of the student by the Thesis Committee members. If the decision of the committee is not unanimous, the case is referred to the Dean for resolution. The degree, in Molecular Virology and Microbiology, will be granted by the School of Medicine.

A student must be on active status (must be registered for a minimum of three credits during a 12 month period) and must register for at least one credit during the term in which they are graduated. Students who complete all the degree requirements in one term but are graduated the next term may petition the dean for a waiver of this requirement. A student who is on inactive status must be readmitted and registered for three credits in order to be graduated.

The School of Medicine stipulates that the following requirements must be met before the last day of the term in which the student has applied for graduation. Students apply for graduation through the Graduate Studies Office under the following guidelines:

1. At least one month prior to defense: Student will make arrangements with program for final defense. This information will be relayed to the Office of Graduate Studies in letter form, stating the student's name, program, degree sought, title of dissertation, date, time and place. This information will be forwarded to the University Times for publication and an announcement will be sent to the Graduate Faculty Members of the School of Medicine.
2. One copy of the dissertation should be deposited at the Graduate Studies Office.
3. After the final defense, the following should be delivered to the Graduate Office as one package:
 - a. One copy of the final approved dissertation (unbound, final corrected version on acid-free paper), with title page signed by all thesis committee members.
 - b. Three additional copies of the abstract (350 word maximum double-spaced), initialed in the upper right hand corner by the student's advisor.
 - c. A letter from the Program Director giving official notice that the candidate has fulfilled all the academic requirements (change of status and grade cards should accompany this letter).
 - d. Forms required:
 - Survey of Earned Doctorate (used by National Research Council)
 - Agreement form to permit publication of dissertation by University Microfilms, Inc.
 - e. An official receipt from University Cashier (G-7 Thackeray Hall) for payment of dissertation binding/microfilming fees.
4. An "Electronic Thesis" can be submitted. Please contact the Graduate Office for details.