

GUIDELINES AND POLICIES FOR THE PhD RESEARCH TRACK IN

MICROBIOLOGY AND IMMUNOLOGY

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GRADUATE CURRICULA IN MICROBIOLOGY AND IMMUNOLOGY

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Introduction:

This document defines the guidelines and policies governing the Doctoral Program in the Department of Microbiology and Immunology, Medical College of Virginia Campus of Virginia Commonwealth University. This is a supplement to the current University Graduate Bulletin. Our Graduate Program includes curricula that lead to the Ph.D. degree or M.D./Ph.D. degree. The information in this document has been prepared as a guide for the graduate faculty and graduate students in the Department. All faculty and students should be thoroughly familiar with the information provided, and should adhere to these guidelines and policies in formulating the student's curriculum of education.

Graduate Program Committee (GPC):

The Graduate Program Committee (GPC) in Microbiology and Immunology is responsible for the implementation and management of the graduate program, as described in this document, and for formulating new or amended policies and practices that are subject to approval by vote of the graduate faculty. The GPC should include representatives from the major research areas of the department. The Chair of the Microbiology and Immunology Department appoints the GPC Chair and one representative from each research track through the Chair's advisory system. Additional membership of the GPC consists of one affiliate appointee elected by the faculty of the Department of Microbiology and Immunology.

Application for Graduate Study in Microbiology and Immunology:

Inquiries regarding information or admission to the graduate program in Microbiology and Immunology are referred to the Chair of the GPC for processing. Formal application is made through the Virginia Commonwealth University Admissions Office, which forwards completed applications with attendant required GRE scores and other documents to the Biomedical Sciences Doctoral Program (BSDP). Applicants may apply for admission to begin studies in any semester of the academic year, but Fall admission is recommended. Specific requirements for admission to the graduate program are defined in the University Graduate Bulletin. Admission requirements for graduate studies in Microbiology and Immunology are flexible. However, knowledge of Organic Chemistry, Fundamentals of Biology, and College Mathematics is considered necessary to pursue advanced studies. Students having a knowledge of College Physics and Analytical Chemistry will also find this helpful in pursuing their studies in Microbiology and Immunology. Foreign applicants who do not use English as their primary language must take the Test of English as a Foreign Language (TOEFL) examination and are expected to achieve a score of 600 or higher.

Selections among the applicants are made after consideration of individual qualifications and availability of facilities. Preference is given to applicants who present academic potential for Microbiology and/or Immunology as demonstrated by their previous academic achievements including grade point average, Graduate Record Examination scores, and personal recommendations. Admission to graduate study in the Department of Microbiology and Immunology leading to the Ph.D. degree requires majority approval and recommendation by the BSDP, and acceptance by the Head of the Graduate Program in the School of Medicine.

Students applying to the M.D./Ph.D. program submit an application through the American Medical College Application Service (AMCAS). After review of the AMCAS documents, the Medical School Admissions Committee will send each qualified applicant supplemental admissions material including an application for the M.D./Ph.D. program. Individuals invited for interviews will participate in the

standard interview for the M.D. program and will be interviewed also by members of the M.D./Ph.D. Steering Committee. After completion of two years of the Medical Curriculum, M.D./Ph.D. students will enter the Microbiology and Immunology Department as graduate students upon approval of the GPC.

Student Support:

Every effort is made to provide Ph.D. and M.D./Ph.D. students (who are in good academic standing) full tuition and stipend support. In addition, support is provided for insurance coverage. However, it is difficult to predict which stipends will become available to the Department of Microbiology and Immunology for dispersal each year to graduate students in a research track. Therefore, acceptance into the Graduate Program cannot be considered a guarantee of financial support to the student. The GPC reviews student records and ranks students competitively based on academic performance, admissions program examination scores, and research progress. This assessment serves as the basis for recommendation and assignment of fellowships and assistantships administered through the department. These activities include the nomination of first year students for NSF and other predoctoral fellowships.

The major sources of support for research track graduate students are as follows:

A. Graduate School Fellowships - Entering Ph.D. students with excellent academic records (currently: 3.2 GPA, 1200 GRE scores [verbal + quantitative]) are eligible for support in full (tuition + stipend) for the first 2 years by the School of Medicine's Office of Graduate Studies.

B. Graduate School Awards of Excellence - Stipend and tuition are awarded to students by the Office of Graduate Studies on the basis of outstanding academic qualifications at the time of acceptance to the graduate program (currently: 3.5 GPA or higher, 1800 GRE scores [verbal + quantitative + analytical]). Higher than average stipends are generally given to such distinguished students. Continued support is contingent on (i) submission of an application for extramural support (e.g., NIH or NSF predoctoral fellowships) each academic year (no later than the end of the Spring semester) by the recipient student in conjunction with advice from the student's temporary or permanent advisor and (ii) maintaining a >3.0 GPA.

C. Predoctoral Grants - The NIH, the National Science Foundation and other foundations have a limited number of pre-doctoral grants for which any student may apply directly. The GPC may select students who represent competitive applicants for predoctoral awards. These students, with the assistance of their temporary advisors or designated faculty, make application for a predoctoral award from extramural sources.

D. Individual faculty research grants - All faculty accepting a graduate student in their laboratory have research grant funding.

E. Departmental awards – Mary P. Coleman and Strauss Award.

Registration for Courses:

To be considered full-time, all students must be registered for at least 12 credit hours and take a minimum of 9 credits per semester in Microbiology & Immunology (MICR) courses. Registration for less than 12 credit hours during the Spring or Fall semester constitutes "part-time" status and results in a student as not eligible to receive a full-time student stipend. Students register for 3-6 credits (MICR697) during the Summer. The selection of courses each semester should be made in consultation with the student's permanent advisor. Under special circumstances the GPC, in consultation with the student, the student's advisor, and the relevant course directors, can vote to relax these requirements.

Adding, Dropping, or Withdrawing from Courses:

Adding, dropping, auditing, or withdrawing from a course outside of the deadline date set by the University for these changes requires signed approval by the permanent advisor. No form can be submitted to the registrar's office without the student advisor's signature. Under special circumstances, a member of the student's Graduate Advisory Committee (GAC), the Chair of the GPC, or the Chair of the Department of Microbiology and Immunology may sign. Copies of the course change form must be sent to the GPC Chair and to the Course Director. Adding, dropping, withdrawing, or auditing a course after the deadline date set by the University cannot be authorized without a 'Special Action' form. These changes require a request in writing to the GPC signed by the student's major advisor. If the GPC approves the student request, then the student must fill out a 'Special Action' form that must be submitted to the School of Medicine Graduate Committee for approval.

Academic Performance:

The following are minimum requirements of the Department of Microbiology and Immunology for satisfactory performance in graduate studies. An individual's curriculum within the department may have requirements that exceed those indicated below. The time limitation for completing degree requirements is eight years for the Ph.D. Program.

All full-time first year students must achieve a 3.0 overall grade point average (GPA) in a minimum of 18 graduate credit hours of required courses (exclusive of research), which are typically taken during the first two semesters while in the BSDP program. Students who do not maintain an overall GPA of 3.0 while in the BSDP program are subject to termination from consideration for admittance to the graduate program in the Department of Microbiology and Immunology. Part-time students must achieve an overall GPA of 3.0 in the first 18 credit hours (exclusive of research) for which they are registered. After the first year of graduate study, continuing students for the Ph.D. degrees must maintain an overall GPA of not less than 3.0 for graduate courses. Students who receive a grade of C or less on six credit hours or 20 percent of the credit hours attempted (whichever is greater), or a student who receives a grade of D or F, will be reviewed for possible academic termination by his/her graduate program faculty.

In the event of an unsatisfactory performance - for example, if a student fails to obtain the minimum GPA - the student's GAC or the student may petition the GPC for permission to continue in the program. Any Ph.D. student who makes less than a 3.0 GPA in any semester must make at least a 3.0 in graduate courses each semester thereafter and must achieve a cumulative GPA of 3.0 or better before he/she can graduate. A student who has petitioned successfully for continuance in the graduate program

who fails to bring the cumulative GPA to 3.0 or better by the end of his/her fourth semester of graduate tenure will be dismissed from the graduate program.

If a student receives a grade of "D", "F" or "U" in any course, then the student must repeat the course(s) and earn a grade of "C" or better to be eligible to receive a degree. A student will be reviewed by his/her graduate program faculty for possible academic termination if he/she accumulates a grade of C or less on six term hours, or 20 percent of the term hours attempted, (which ever is greater), or receives a grade of D or F in the repeat course. The course (credits and grade) can be counted only once for graduation credits. Students may not take the written or oral examination for the Ph.D. degree, if their overall grade point average is below 3.0. Research credits shall not be counted in computing this average, which shall be graded as P = pass, U = unsatisfactory, or F = fail.

In summary, unsatisfactory performance includes: (1) receiving a grade of C or less on six term hours or 20% of the term hours attempted (whichever is greater), (2) receiving a grade of D, F, or U in any course, (3) achieving a GPA of less than 3.0 after the first year of graduate school work, (4) failure of the written or oral examination, or (5) failure of the final oral defense. Failure to achieve and maintain the requirements indicated above could result in dismissal from the Microbiology and Immunology graduate program. Students with unsatisfactory performance must obtain approval of the School of Medicine Graduate Committee to continue in the graduate program.

Major Advisor Selection:

The selection of a Major Advisor from among the graduate faculty is one of the most important decisions that Ph.D. and M.D./Ph.D. students make during their graduate careers. The advisor will have more influence on a student's training, direction and career choices than any other faculty member. The Major Advisor provides day-to-day guidance during the student's research activities and scientific development, and so predicting a successful working relationship is an important decision for any new student. The philosophy of this Department is to permit students with as much latitude as possible in making this important decision. In addition, the graduate faculty members who wish to accept a student have the responsibility of providing financial support for the student from their own research funds, and this requires careful long-term consideration on the part of the graduate faculty.

All Ph.D. students must have either selected a Major Advisor by the end of their second semester of graduate study or have petitioned the GPC to perform an additional rotation. However, all students must have a major advisor prior to final registration for their third academic semester. No requests for assignment to a major advisor can be submitted to the GPC until the first day of the second semester of residence in the graduate program. A letter addressed to the GPC Chair, indicating selection of the permanent advisor, must be sent by the student and bear his/her signature. The letter must be cosigned by the chosen mentor, indicating his/her agreement to the same and that he/she has identified funds to support the student. After approval, the GPC will recommend the appointment to the Chair of the School of Medicine Graduate Committee, who shall make the appointment official.

Changing the Major Advisor:

Rare circumstances may arise in which it is in the best interest of a student and/or Major Advisor to dissolve their association, which will necessitate (i) movement of the student to a new laboratory, and (ii) identification of new sources of student funding. In general, this should be viewed as a solution of last resort. Assistance should be sought from the Chair of the GPC or Chair of the Department if a potentially serious problem arises between the student and mentor that cannot be solved to their mutual satisfaction. The student should consult with each member of his/her Student Graduate Advisory Committee. In addition, a Major Advisor may resign as the student's advisor, but this should be discussed first with the Department Chair for practical solutions.

If all attempts at mediation fail, the student may request an assignment to a new major advisor, which must be made in writing to the GPC (attention Chair of the GPC). Following deliberation by the GPC and, if necessary, consultation with the Chair of the Department of Microbiology and Immunology, the GPC will forward a written recommendation to the Chair of the School of Medicine Graduate Committee. Following deliberation by the GPC and, if necessary, in consultation with the Chair of the Department of Microbiology and Immunology, the GPC will make a recommendation regarding assignment of a new advisor. The written recommendation will be forwarded to the Chair of the School of Medicine Graduate Committee. A decision to assign a new permanent advisor will be predicated on mutual agreement of the prospective advisor and the student.

Student's Graduate Advisory Committee (GAC):

In consultation with the Major Advisor, potential members of a student's GAC should be contacted during the third semester of training. The student should then file the Admission to Candidacy Form and select their GAC in GradTrak

<https://login.vcu.edu/cas/login?service=https://www.apps.som.vcu.edu/gradtrak/login/login.aspx>

A student's GAC for the Ph.D. program is composed of a minimum of three graduate faculty members holding a primary appointment in the Department of Microbiology and Immunology and two additional graduate faculty members from outside the Department of Microbiology and Immunology. The student's Major Advisor serves as the Chair of the GAC for the Ph.D. program and must have an appointment in the Department of Microbiology and Immunology.

The Ph.D. and M.D./Ph.D. student's progress and development will be monitored and guided by the student's GAC and Major Advisor. The student's GAC will approve the student's dissertation topic, administer the written and oral examinations, oversee the student's dissertation research on a regular basis, supervise the dissertation defense, and approve the dissertation when satisfied with its quality. The student's GAC is responsible for establishing the content of the student's course work in final detail, as well as monitoring the progress of the student's research. The final curriculum for the Ph.D. degree shall be formulated and approved by the student's GAC (in consultation with the student) and must be reviewed by the GPC which, in turn, will forward the final curriculum to the School of Medicine Graduate Committee for approval.

The student's GAC will meet with the student at least once a year. Occasions may arise in which it is necessary to change the committee composition, and substitution of one member for another should be accomplished by formal approval of the department GPC.

Records of Graduate Progress:

A "Semester Report on Graduate Student Status" form (see Appendix) documenting the student's progress is submitted to the GPC at the end of each academic semester (e.g., first weeks of January and June) by the student's major advisor. This describes progress with regard to the degree requirements, completion of teaching experiences, and includes comments on the student's overall development and academic/research accomplishments. Major advisors should take advantage of this opportunity to document any concerns about a student's performance in the research laboratory.

The GPC will call a meeting of the Graduate Faculty at least twice each academic year after the end of each semester (e.g., January and June). The agenda may include the following: (1) updating of the Graduate Faculty of the progress of all graduate students in the Department; (2) voting as a faculty on the continuation, promotion, or retention of each graduate student enrolled in the program; (3) discussion of, and/or voting on, faculty related policy developments or changes, and (4) discussion and/or voting on policies or changes in guidelines developed by the GPC. New policies formulated by the GPC become effective only after they have been approved by vote of the graduate faculty of the Department of Microbiology and Immunology. The GPC is authorized to convey to the student in writing, the report of his/ her progress as discussed at the semi-annual Graduate Faculty Meetings.

The "Semester Report on Graduate Student Status" forms will be maintained in the student's permanent file within the Department of Microbiology and Immunology. The file will be used as an aid for assignment of teaching experiences and for monitoring the accuracy of student reports and forms submitted periodically to the Department. The GPC will review the Graduate Student Status forms (at least once per semester) and, if necessary, make appropriate recommendations to the student's GAC. In addition, each student must update on an annual basis his/her student file as to current address.

Appeals:

Under extraordinary circumstances, appeals to the GPC may be made to waive certain Department requirements, but not University requirements. The GPC lacks the authority to waive University requirements and guidelines. Both the student's advisor (and/or GAC) and the student must petition the GPC separately in writing for a waiver. If the GPC considers the petition favorably, the petition will be sent, along with a letter of recommendation, to the office of the Chairperson, School of Medicine Graduate Committee and made a part of the student's permanent file.

GRADUATE CURRICULA IN MICROBIOLOGY AND IMMUNOLOGY

General Guidelines:

- Courses - Students in the graduate program in Microbiology and Immunology must meet all requirements specified in their approved curriculum of study in order to obtain a degree. However, the student's Graduate Advisory Committee (GAC) can elect to alter the curriculum requirements when such changes are beneficial to the student. A curriculum is developed by the student and the student's GAC that should be reviewed by the GPC before submission to the Graduate Committee of the School of Medicine for approval.
- Students should gain a working knowledge of the handling and use of radioisotopes and take the course in radiation safety offered on campus. An understanding of statistics is also encouraged.
- MICR690 - All students are required to attend all Departmental Seminars and all presentations in the Student Research Seminar series throughout their tenure. Beginning with the second year of the program, students give an annual presentation in the Student Research Seminar series. Ph.D. students should present at least 4 research seminars during their tenure as graduate students. A seminar as part of the thesis defense will fulfill this obligation in the last year of the student's graduate tenure.
- MICR691 - Students are required to register for a Journal Club starting in the second year of their program.
- Research - Ph.D. and M.D./Ph.D. students in the Department of Microbiology and Immunology are required to conduct an original, independent research project under the supervision of their advisor. The research project is a major component of the graduate curriculum. A dissertation (Ph.D. or M.D./Ph.D. degree) reporting the results of an original investigation and its significance in relation to existing scientific knowledge must be written. It should conform to the general style and format of journals such as those published by the American Society for Microbiology (this format is specified by the MCV Graduate Committee).

A. Doctor of Philosophy (Ph.D.) Program

The student and the student's GAC will formulate a suitable curriculum of study based on the student's area of interest. The GPC must review the curriculum of study and will forward its approval to the MCV Graduate Committee of the School of Medicine for final approval.

Curriculum: All Ph.D. programs of study must include:

- BIOC 530 Mod 1: Protein Structure and Function
- BIOC 531 Mod 2: Basic Metabolism
- BIOC 532 Mod 3: Central Dogma of Molec
- BIOC 533 Mod 4: Lipids/Membranes & Bio
- BIOC 691-802 Critical Thinking
- IBMS 600 Laboratory Safety
- IBMS 610 Research Opportunities
- IBMS 620 Laboratory Rotations
- IBMS 620 Laboratory Rotations
- IBMS 690 Research Seminar [Can be substituted by MICR 690]

- MICR/BIOC 504 - Cell and Molecular Biology
- MICR 505 - Immunobiology
- MICR 515 Principles of Molecular Microbiology
- MICR 690 - Research Seminar
- Journal Club - For the second year and beyond, students register for one of the following journal clubs based on their research interests students may select from three possibilities listed below:
 - MICR 692 – Current Topics in Molecular Pathogenesis
 - MICR 693 – Topics in Molecular Biology & Genetics
 - MICR 694 - Current Topics in Immunology

Other Courses:

- MICR 686 - Advanced Immunology - taken twice for a grade by Immunology Track students.
- MICR 616 - Mechanisms of Viral and Parasite Pathogenesis
- MICR618 - Molecular Bacterial Pathogenesis
- MICR 605 - Molecular Genetics
- Courses in Special Topics as well as courses from other departments are encouraged and may be made a requirement by the student's GAC.

Normally, a student will have earned about 40 semester hour credits in formal graduate courses before taking the comprehensive written examination. A maximum of eight semester hours of graduate credits applicable toward the degree may be transferred from another recognized institution or from another Virginia Commonwealth University program. This requires the recommendation of the student's GAC and approval by the GPC and the chair of the Graduate Committee of the School of Medicine. A typical curriculum schedule for the Ph.D. program is outlined in the Appendix.

Seminars: Ph.D. students are required to attend Student Research Seminar (MICR690) and Department Seminar (MICR690) throughout their tenure in the graduate program regardless of whether or not they are registered for MICR690 for credit. First year students will not give presentations at these seminars nor be required to register. Students must be registered for MICR690 during Fall and Spring semesters throughout their second and subsequent years. However, the student is required to present a seminar for only one semester within a given year. In the second year, each student must give one 30 minute (maximum) research presentation in the Student Research Seminar session of MICR690. In the third and subsequent years, each student will give a 45 minute research presentation. Students typically present at least three research seminars based on their research prior to their dissertation defense. The dissertation presentation may be used to fulfill the last year's research seminar requirement. The guidelines defining the nature of these presentations are set by the MICR690 Course Director.

Written Examination: The written examination is designed to assess the student's ability to work creatively in his or her area of academic specialization. The student's GAC members, who form the examination committee, will test the student's ability to think analytically and critically about the scientific literature, to use the scientific method, to apply what he/she has learned in addressing scientific problems, and to propose hypothesis driven research experiments. The examination may be

used as a diagnostic tool to identify areas of deficiency in the student's base of knowledge that can be appropriately remedied by course work, reading or by other means.

The written examination is prepared and administered by the student's GAC. The student should have a first GAC meeting in the 2nd year with his/her GAC to review previous performance and outline research goals so that the GAC members will be able to ask appropriate questions germane to the student's research interests. A memo should be filed with the department GPC to document this meeting, to state the tentative title of the student's research project, and the membership of his/her GAC (see Appendix).

The written examination is usually taken in the Spring-2nd year. The examination consists of a variety of questions that should challenge the student's creative and analytical thinking abilities, such as: data interpretation, design of experiments, or critical scientific analysis of a paper. Generally, there is one question from each member of the student's GAC. The GAC may invite faculty members who have expertise in a given area to submit questions for the examination. Before administering the examination, the members of the student's GAC must unanimously approve of all the questions on the examination. The major advisor should submit a memo to the GPC Chair to document approval by the GAC of the examination questions to be asked. Each faculty member of the student's GAC is responsible for grading his/her questions. The GAC then meets in executive session to determine the final disposition for the examination. To pass, the student must achieve a minimal overall score of 80% on the examination and no more than one question with a score below 70%. A memo is then sent to the GPC Chair to document that the student has passed (see Appendix). In case of failure, the examination may be retaken only upon approval of the department GPC and the School's Graduate Committee. The retake of the written examination must occur within 90 days following the first examination. If the examination is failed a second time, the student will not be allowed to continue in the Ph.D. program and must transfer to a M.S. Program. The student is then subject to all stipulations and guidelines that govern the M.S. program.

Oral Examination and Research Proposal: The student generally prepares for the oral examination within 6 months of successful completion of the Written Examination. The oral examination is designed to assess the student's aptitude and potential to ultimately perform as an independent scientist. This examination involves the defense of a research proposal written by the student that describes the research plan he/she expects to follow and which should lead to the Ph.D. dissertation. The student will be evaluated based on his/her ability to (a) demonstrate the ability to define scientific problems and design reasonable and efficient experimental plans to solve them, (b) explain the rationale behind the choice of methods and experimental designs presented in the proposal, and evaluate alternative approaches, (c) demonstrate a developing knowledge of the literature and methodologies relevant to the proposal, and (d) demonstrate a developing ability to critically evaluate both the literature and his/her own experimental results. The examination should be given within 6 months after passing the written examination. The examination committee consists of the student's GAC. To qualify as a Ph.D. candidate, the oral examination must be completed prior to the start of the fourth year of training.

a. Preparation of the grant proposal. The student writes a research grant proposal on his/her own research project according to the instructions that apply to the 'Research Plan' section of a NIH Postdoctoral Fellowship application. The scope of the proposal should be defined by the student's GAC. Students who have submitted predoctoral grant proposals for extramural

support, such as the National Science Foundation, may use these applications to fulfill the research grant proposal requirement. The proposal will be completed at an early phase of the student's research project (usually 3rd year-Fall semester) and will be submitted for approval to the student's GAC. Note that the research proposal is not intended to confine the development of the student's independent research project, which may take on different directions depending upon new results. This grant proposal will serve as the departure point for questioning for the oral comprehensive examination (see below).

The Research Proposal should not exceed 10 single-spaced pages in total. Brief guidelines for the proposal's format are as follows:

I. **Specific Aims.** What do you intend to do or discover? State your research project in about 3 to 5 clear and realistic one-sentence objectives. Generally, you should state each objective as: "Determine the mechanism, or role, or structure, or pathway, etc." of some aspect of your research project. Also, state the hypothesis to be tested for each objective. A few more sentences after each objective may be necessary to clarify essential components of the project. This section should not exceed 1 page.

II. **Background and Significance.** Why is the work you are going to do important? Describe the background to the proposal in a logical order and in sufficient detail so that the reader will understand your objectives. Critically evaluate existing knowledge and the appropriate literature. Describe gaps in this knowledge that may be filled by the proposed work. Describe published and unpublished data and their sources that are pertinent to the proposal.

III. **Preliminary Studies.** Describe your own preliminary studies and the data you have obtained in the laboratory that are relevant. Graphs, tables and figures are encouraged and can be placed in an appendix.

IV. **Research Design and Methods.** Discuss the experimental design for each Specific Aim in detail. Briefly describe the procedures that will be used. Include how the data will be collected, analyzed and interpreted. Describe new methods and the advantages over existing methods. Discuss the potential difficulties and limitations of the proposed procedures. Describe alternative and complimentary approaches to achieve the aims.

The student should freely discuss the experimental plan and ideas with his/her advisor, other faculty and students. However, the writing of the proposal should reflect the student's own efforts. [Omit: The grant proposal must be submitted to the Department GPC for approval as acceptable]. The GPC then transmits the grant proposal to the student's Graduate Advisory Committee (GAC) and to the Dean's Representative at least two weeks prior to the date of the oral examination.

b. Oral Defense of the Proposal: The research grant proposal prepared by the student (see above) will serve as the departure point for questioning for the oral part of the examination. Although the examination will focus on the proposal and related subjects, questions should be asked to test the breadth of the student's analytical abilities in peripheral areas as well. The oral

examination must be scheduled through the Graduate Education Office. The oral examination committee will consist of the student's GAC and the Dean or a designated Dean's representative. Following the oral examination, the oral examination committee meets in executive closed session to vote. All members of the oral examination committee must vote to either Pass or Fail the student. To Pass the examination, the student must receive no more than one negative vote. The student's GAC will review the progress of the student to date and submit a memo (see Appendix) to the department GPC that the student has passed the oral examination, thus recommending that the student be admitted to candidacy for the Ph.D. degree. The GPC will then forward the recommendation to the Chair of the Graduate Committee.

The oral examination must be successfully completed at least six months before submission of the doctoral dissertation. If failed, this examination must be retaken within 60 days following approval of the GPC and the School's Graduate Committee. If the examination is failed a second time, the student will not be allowed to continue in the Ph.D. program and will be transferred to the M.S. program. The student is then subject to all stipulations and guidelines that govern the M.S. program.

Dissertation: Ph.D. students must complete an original, independent research project under the supervision of their advisor. A written dissertation is prepared to report the results of an original investigation and its significance in relation to existing scientific knowledge. The goal of a scientist is to create new knowledge, and so the dissertation should formally demonstrate the student's ability to achieve this goal. Consequently, the quality and quantity of new knowledge that is generated will be the primary factor in determining the acceptability of a student's dissertation to his/her advisor and GAC. However, it is not possible to describe a precise standard by which to judge the acquisition of new knowledge. The following benchmarks are offered as a guide to students and their GAC's to evaluate the body of work: (a) A dissertation should address a significant biological or medical problem. In that it represents considerable effort by the student, the expenditure of time and resources should be justified. (b) A dissertation should be focused. The hypotheses tested should be clearly related to a well-defined subject, and the questions addressed should build upon one another to develop a body of knowledge. A series of unrelated findings should not be acceptable. (c) The conclusions drawn should be valid and based on adequate evidence presented. Appropriate controls should be clear in each experiment, and the technologies used should be modern and sufficiently powerful.

The format of the dissertation should conform in general style to that of journals such as those published by the American Society for Microbiology as specified by the Dean's office. Each member of the student's GAC must sign a signature page signifying his/her approval of the final dissertation document.

Dissertation defense: Upon satisfactory completion of all required formal course work, passing of the written and oral examinations, approval of the dissertation by the student's GAC, and completion of teaching and all other requirements, the student's advisor will notify the Chair of the Graduate Committee and schedule the dissertation defense. The time and place of the defense, along with the candidate's name, department, and dissertation title shall be announced by the Chair of the Graduate Committee at least seven days prior to the scheduled day of the defense.

The first part of the dissertation defense consists of a seminar in which the student presents the research project. The seminar is open to all interested parties and is followed by questions from the audience. The second part of the defense consists of an oral examination conducted in closed session and open only to the faculty and the student's oral examination committee. The oral examination committee consists of all members of the student's GAC (There is no Dean's Representative for the Dissertation Defense). The oral examination committee will ask questions concerning the course work and the dissertation, and will assess the student's ability to think and communicate using facts and concepts gained from his/her studies. Faculty who are not members of the oral examination committee are also expected to ask questions and may comment, but not vote, on the success or failure of the candidate. The student's advisor, as Chair of the oral examination committee, must allow ample time during the examination for questioning by faculty members. Following the oral examination, the oral examination committee meets in executive closed session to vote. All members of the oral examination committee must vote to either Pass or Fail the student. To Pass, the student must receive no more than one negative vote. If the student fails the dissertation oral examination, he/she after consultation with his/her Graduate Advisory Committee, may repeat the oral examination component within 90 days following approval by the GPC and the Graduate Committee. If the student fails the examination a second time, then he/she is dismissed from the Ph.D. program.

B. Doctor of Medicine/Philosophy (M.D./Ph.D.) Program (See Addendum I)

A suitable curriculum of study will be formulated by the student and the Graduate Advisory committee based on the student's area of specialization. The curriculum must be reviewed by the GPC, which will submit the curriculum to the Dean, School of Medicine for approval. M.D./Ph.D. students must follow the guidelines established by the M.D./Ph.D. Steering Committee. All M.D./Ph.D. programs include two years of course work in the medical curriculum and usually three laboratory rotations before beginning the graduate phase of the program. Students must register for Scientific Integrity (MICR510).

Seminars: Students must attend the bi-monthly research meetings of the M.D./Ph.D. program. Attendance at the Graduate Student Research Seminar Sessions of MICR690 is recommended. A presentation of research should be given once a year to the Department of Microbiology and Immunology.

Curriculum: A typical curriculum of study for the M.D./Ph.D. in Microbiology and Immunology contains a nucleus of graduate courses similar to those found in the Ph.D. degree program. Normally, a student will have completed two years of course work in the Medical Curriculum and earned about 24 semester credit hours in formal graduate courses before taking the written examination. (See Appendix). The student must complete successfully one teaching experience.

Grant Proposal, Written and Oral Examinations, Dissertation, and Defense: The requirements for a grant proposal, for written and oral examinations, and for the dissertation and oral defense are as indicated for the Ph.D. program (see above). However, unlike Ph.D. students, M.D./Ph.D. students who fail their comprehensive examinations twice do not have the option of transferring to an M.S. program, but will be transferred to the M.D. program. In addition, M.D./Ph.D. students must pass Part I of the National Medical Board Examination in order to continue in the Graduate Program.

Dissertation: Ph.D. students must complete an original, independent research project under the supervision of their advisor. A written dissertation is prepared to report the results of an original investigation and its significance in relation to existing scientific knowledge. The goal of a scientist is to create new knowledge, and so the dissertation should formally demonstrate the student's ability to achieve this goal. Consequently, the quality and quantity of new knowledge that is generated will be the primary factor in determining the acceptability of a student's dissertation to his/her advisor and GAC. However, it is not possible to describe a precise standard by which to judge the acquisition of new knowledge. The following benchmarks are offered as a guide to students and their GAC's to evaluate the body of work: (a) A dissertation should address a significant biological or medical problem. In that it represents considerable effort by the student, the expenditure of time and resources should be justified. (b) A dissertation should be focused. The hypotheses tested should be clearly related to a well-defined subject, and the questions addressed should build upon one another to develop a body of knowledge. A series of unrelated findings should not be acceptable. (c) The conclusions drawn should be valid and based on adequate evidence presented. Appropriate controls should be clear in each experiment, and the technologies used should be modern and sufficiently powerful.

The format of the dissertation should conform in general style to that of journals such as those published by the American Society for Microbiology as specified by the Dean's office. Each member of the student's GAC must sign a signature page signifying his/her approval of the final dissertation document.

Dissertation defense: Upon satisfactory completion of all required formal course work, passing of the written and oral examinations, approval of the dissertation by the student's GAC, and completion of teaching and all other requirements, the student's advisor will notify the Chair of the Graduate Committee and schedule the dissertation defense. The time and place of the defense, along with the candidate's name, department, and dissertation title shall be announced by the Chair of the Graduate Committee at least seven days prior to the scheduled day of the defense.

The first part of the dissertation defense consists of a seminar in which the student presents the research project. The seminar is open to all interested parties and is followed by questions from the audience. The second part of the defense consists of an oral examination conducted in closed session and open only to the faculty and the student's oral examination committee. The oral examination committee consists of all members of the student's GAC (There is no Dean's Representative for the Dissertation Defense). The oral examination committee will ask questions concerning the course work and the dissertation, and will assess the student's ability to think and communicate using facts and concepts gained from his/her studies. Faculty who are not members of the oral examination committee are also expected to ask questions and may comment, but not vote, on the success or failure of the candidate. The student's advisor, as Chair of the oral examination committee, must allow ample time during the examination for questioning by faculty members. Following the oral examination, the oral examination committee meets in executive closed session to vote. All members of the oral examination committee must vote to either Pass or Fail the student. To Pass, the student must receive no more than one negative vote. If the student fails the dissertation oral examination, he/she after consultation with his/her Graduate Advisory Committee, may repeat the oral examination component within 90 days following approval by the GPC and the Graduate Committee. If the student fails the examination a second time, then he/she is dismissed from the Ph.D. program.

MODEL CURRICULUM FOR Ph.D. PROGRAM*Department of Microbiology & Immunology***Semester 1 (BSDP) - Fall** (taken by all 1st yr students)

- Temporary Advisor assigned
- BIOC 530 Mod 1: Protein Structure and Function (2)
- BIOC 531 Mod 2: Basic Metabolism (1)
- BIOC 532 Mod 3: Central Dogma of Molec (1)
- BIOC 533 Mod 4: Lipids/Membranes & Bio (1)
- BIOC 691-802 Critical Thinking (1)
- IBMS 600 Laboratory Safety (1)
- IBMS 610 Research Opportunities (0.5)
- IBMS 620 Laboratory Rotations (2)
- IBMS 620 Laboratory Rotations (2)
- IBMS 690 Research Seminar (1) [Can be substituted by MICR 690]
- MICR505 Immunobiology (3)
- MICR515 Principles of Molecular Microbiology (3)

Semester 2 (BSDP) - Spring (* = student takes 2 of 3 available courses)

- BIOC 691-802 Critical Thinking (1)
- IBMS 620 Laboratory Rotations (2)
- MICR/BIOC 504 Biochem. Mol. Cell Biol. (5)
- MICR686 Advanced Immunol. (2)*
- MICR616 Mechanisms of Viral & Parasite Pathogenesis (3)*
- MICR618 Molecular Bacterial Pathogenesis (3)*
- MICR690 Student Research seminar (Attendance required)
- MICR690 Departmental seminar (Attendance required)
- **Cumulative GPA of 3.0 required to continue**
- **Permanent Advisor chosen after 4 rotations completed**

Summer

- MICR697 Research (3-6 credits)

Year 2: Semesters 3-4 - Fall / Spring (+ = optional electives)

- MICR697 Research (variable credits)
- OVPR 601 Scientific Integrity (1)
- MICR607 Techniques (2)
- MICR690 Student Research Seminar (1)
- MICR690 Dept. Seminar (Attendance required)
- MICR691 Journal Club (1, Pass/Fail)
- MICR606 Molec. Genetics (3)+
- MICR653 Adv. Molec. Genetics+
- Student's GAC formed, 1st meeting held in the fall
- Written Examination in the Spring

Summer

- MICR697 Research (3-6 credits)

Year 3: Semester 5-6 - Fall / Spring

- MICR697 Research (variable credits)
- MICR690 Student Research Seminar (1)
- MICR690 Dept. Seminar
- MICR691 Journal Club (1, Pass/Fail)
- Oral Examination

Summer

- MICR697 Research (3-6 credits)

Years 4-8 Fall / Spring

- MICR697 Research (variable credits)
- MICR690 Student Research Seminar (1)
- MICR690 Dept. Seminar
- MICR691 Journal Club (1, Pass/Fail)

Summer

- MICR697 Research (3-6 credits)

APPENDIX II

Summary of Degree Requirements

Department of Microbiology & Immunology

	Ph.D.	M.D./Ph.D.
Grade Point Average	3.2	3.2
BIOC 530-533	Yes	No
MICR 504	Yes	No
MICR 505	Yes	
MICR 515	Yes	
Laboratory Safety (IBMS 600)	Yes	Yes
Research Opportunities (IBMS 610)	Yes	
Laboratory Rotations (IBMS 620)		
Scientific Integrity (OVPR 600)	Yes	Yes
Examinations	Written + Oral	Written + Oral
National Medical Boards	No	Yes
Research Seminar [IBMS 690 (first year) and MICR 690]	1 per year*	1 per year*
Oral Examination/Defense	Yes	Yes

*after the first year in the program

**Selection of Permanent Advisor Memorandum of Understanding (MOU)
VCU Department of Microbiology and Immunology**

Dear: _____ and _____ of the Dept. of _____.
Student Permanent Advisor Advisor's Primary Department

Congratulations on together making a Ph.D. student / permanent advisor match. This is an important event, and all the faculty members of the Department of Microbiology & Immunology (M&I) wish you both a successful and productive time of research training and collaboration. The main goal for the student, under the advisor's direction, is to obtain original research findings that will result in both a Ph.D. thesis and peer-reviewed publications. Good luck to you both.

The primary purpose of this MOU is to advise both the student and advisor of the financial responsibilities inherent in the introduction of a new student into a mentor's laboratory. For the student's first 1 to 2 years, the School of Medicine will often provide the student with a stipend, tuition, fees and health insurance. After that period, the permanent advisor will assume responsibility for the student's stipend, tuition, fees and insurance (by providing a budget code to the M&I Accounting Office). The advisor's signature below acknowledges this responsibility in accepting the student. Administrative approval of this match between a graduate student and permanent advisor, indicated by the signatures below, involves a financial analysis to determine whether the advisor's current finances are sufficient to accept a new student and/or whether the advisor has demonstrated a successful history of research funding. The minimum annual student stipend will set each year on July 1 by the M&I Department. Financial support is contingent upon continued successful academic and research performance on the part of the student, and may be discontinued if the student is placed on academic probation. In general, funding of the student will end after 5 years of residence in the graduate program, except under unusual circumstances and requested by the advisor.

In the unforeseen event that the advisor's grant funding lapses during the student's initial 5 years in the program, it will become the responsibility of the advisor's primary department to attempt to identify a source of internal or external financial support for the student (i.e., stipend, tuition, fees and health insurance, and provide a budget code to the M&I Accounting Office). The signature of the advisor's primary department chair acknowledges this responsibility.

Under the unusual circumstances where neither the advisor nor the primary department are able to identify a source of support, the student must assume personal responsibility for his/her own continued financial support (including tuition and fees) to permit continuation in the graduate program. This may require an application for a student loan. The student's signature below acknowledges this potential responsibility.

Also, the advisor and the student agree by their signatures below to follow the Graduate Program Guidelines for the Department of M&I. The advisor agrees to report the progress of the student each semester using the M&I Progress Report Form from the M&I Graduate Program Committee. This will provide a formal documentation of all important milestones in the graduate student's program of study. Thank you.

Signatures below indicate agreement with the above MOU:

M&I Chair Name & Signature / Date

Faculty Advisor Name & Signature / Date

Department Administrator Name & Signature / Date

Student Name & Signature / Date

Graduate Program Director Name & Signature / Date

Advisor's Dept. Chair Name & Signature / Date (for Affiliate Faculty)

Budget/Index Code _____

Return signed form to Ms. Martha VanMeter, PO Box 980678.

Copies to: SOM Associate Dean for Graduate Education (Dr. Jan Chlebowski), Affiliate Department Fiscal Administrator (if applicable), M&I Program Director (Dr. Guy Cabral), M&I Fiscal Administrator (Connie Babcock), Student and Advisor.

SEMESTER REPORT ON GRADUATE STUDENT STATUS

Department of Microbiology & Immunology

**DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY
SEMESTER REPORT ON GRADUATE STUDENTS**

Semester Report on Graduate Student Status: Fall Spring Year: _____

Student Name: _____

Advisor Name: _____

Degree Sought: MS PhD MD/PhD

Is there an official committee form with the Dean's signature in the student's file in the office?
_____ Yes or No _____

Graduate Advisory Committee:

Date of Graduate Advisory Committee Meetings (One per Academic Calendar Year)	Minutes Submitted

Comments on academic status, grade point average, course work:

Comments on Comprehensive Examination (date of completion or planned examination):

Written Exam (Date Taken)	Passed (Yes or No)	If No, Written exam retaken (Date)	Passed (Yes or No)

If not taken, has the examination been planned? _____

If so, when? _____

Oral Exam (Date Taken)	Passed (Yes or No)	If No, Oral exam retaken (Date)	Passed (Yes or No)

Semester Report on Graduate Student
Page 2

Comments on Research Seminar Presentations:

Comments on Completion of Teaching Experience Requirements:

TA Assignment	Semester Assigned	Completed (Yes or No)

Comments on Student's scholarly productivity (abstracts, manuscripts, oral presentations and attendance at meetings, etc.):

Grant Submission Date	Grant Title	Was grant awarded? (yes or no)

Manuscript Submitted (Title)	Journal	Date

Oral Presentations (Title)	Date Presented	Location (Meeting)

Other Comments (e.g., awards received, etc.):

Changes in Committee composition, course plan, or research project since initial approval by MCV Graduate Committee (if applicable):

Anticipated date of completion of all degree requirements: _____

Advisor signature: _____ Date: _____

STUDENT'S GRADUATE ADVISORY COMMITTEE (GAC) MEETING REPORT

Department of Microbiology & Immunology

Student:

Degree Sought / Year in Program:

Major Advisor:

Meeting Date/Time/Place:

Committee Members (NP = indicated if not present):

- 1.
- 2.
- 3.
- 4.
- 5.

Comments on the meeting and progress of the student:

Submit completed form to the GPC Chair

GRADUATE STUDENT WRITTEN EXAMINATION REPORT

Department of Microbiology & Immunology

Examination (Written or Oral):

Student:

Degree Sought / Year in Program:

Major Advisor:

Meeting Date/Time/Place:

Title of Research Project:

Graduate Advisory Committee Members (indicate Pass or Fail for each):

Committee Member Name (Please Print)	Pass/Fail	Committee Member Signature
1.		
2.		
3.		
4.		
5.		

Comments on the meeting and progress of the student:

Submit completed form to the GPC Chair

GRADUATE STUDENT ORAL EXAMINATION REPORT
Department of Microbiology & Immunology

Completion of Oral Exams

Name

VCU ID NUMBER (-----)

Date of Completion

Advisor Signature

Committee Member Sign Print

Dean's Rep Sign Print

<p>For Advisor Use Only</p> <p>Authorization for Stipend</p> <p>Budget Code to charge: _____</p> <p>Advisor Signature: _____</p>

<p>Office Use Only</p> <p>Date Received: _____</p> <p>Date Completed: _____</p>
--

GRADUATE STUDENT DEFENSE AND GRADUATION REPORT

Department of Microbiology & Immunology

DEFENSE AND GRADUATION

Please return to the department of Microbiology and Immunology

Name

VCU ID NUMBER (7-----)

Date of Defense

Date of Separation from University as a Student (*please attach letter of offer if continuing to work at the University for a specific time period*)

Advisor Signature Print

Committee Member Signature Print

Office Use Only Date Received: _____ Date Completed: _____
--

M.D./Ph.D.

Transition from M.D. to Ph.D. Protocol

1. M.D./Ph.D. students are to complete the face page of the Graduate School application (see attached) in hard copy **on matriculation at VCU**. The application form is provided by the M.D./Ph.D. program office and is returned to that office. **Do not file the “on-line” Graduate School application form.** The student will not need to indicate the department/program of study for the Ph.D. at this time. *(With the assistance of the School of Medicine Registrar, the School of Medicine obtains a copy of the student application on matriculation to establish a Ph.D. training file).*

2. Students should normally identify the proposed laboratory and specific program to which they are seeking admission **by June 30** following the completion of the M-II year. An extension to **July 31** may be granted by the M.D. / Ph.D. Program Director. Both the M.D./Ph.D. Program and the identified Graduate training program must accept the student for training in a particular laboratory.

3. The prospective advisor is responsible for informing the appropriate **Graduate Program Director** and his/her **Chair and Fiscal Administrator** of the intention to accept a student for training in her/his laboratory. The School of Medicine **Office of Graduate Education** will normally provide a copy of the student file to the **Graduate Program Director** on request.

4. On acceptance by the Graduate Program, the Graduate Program Director files a *Graduate School Application Action Form* with the **School of Medicine Office of Graduate Education**. The School of Medicine Office of Graduate Education forwards a copy of the Action Form to the **VCU Graduate School** to record the initiation of the graduate phase of training.

5. Students have the responsibility of filing the M.D./Ph.D. transition form with the **M.D. /Ph.D. Program Office** and providing a copy of the completed transition form to the **Graduate Program Director** of the program which they are joining as of **June 30**. Failure to provide the requisite information to these offices may result in the delay of the implementation of stipend support and provision of tuition and fees.

6. Students normally transition to Ph.D. training immediately following the completion of the M-II year. Students are reminded of their responsibility to follow the registration procedures as graduate students as required by their program and the School of Medicine.

Students initially register for the Fall semester following acceptance by a laboratory and program for the Ph.D. phase of training and are strongly encouraged to have the Student Advisory Committee approved in the initial Fall term of Ph.D. training. In the graduate phase of training, students must register for Spring, Summer and Fall terms.

7. Students who wish to delay identification of their Ph.D. program/laboratory should consult with the Director of the M.D./Ph.D. program **well in advance** of the **June 30** deadline.

School of Medicine

Goals, Objectives and Measures 2008 09

M.S. and Ph.D. Programs

GOALS

The program is designed to provide students with the skills required to advance to positions as bioscience researchers/trainers in a broad spectrum of positions.

The structure of the program provides a framework for the progressive development of a mastery of the current state of the subject matter of bioscience, an ability to synthesize this information and apply this foundation to the identification of key areas of investigation/experimentation in bioscience.

The program relates the above framework to the development of the ability to design, implement and interpret experimental approaches which address the questions identified.

In addition, program will develop skills in the various means of communicating both the core of bioscience knowledge and the expression of experimental design, results and interpretation to a variety of potential audiences.

OBJECTIVES

Oral Communication Skills

The candidate will demonstrate the achievement of an appropriate level of oral communication skills with respect to the content, organization, logical flow, presentation and appropriate use of language incorporating the use of visual aids, as measured by rubric.

Written Communication Skills

The candidate will demonstrate the achievement of an appropriate level of written communication skill with respect to grammar, syntax, spelling and use of vocabulary to effectively present information including the use of figures, tables and citations as measured by rubric.

Experimental Design

The candidate will demonstrate the achievement of an appropriate level of competence in the ability to appraise, modify and / or create and implement experimental protocols and to design and develop experiments as measured by rubric.

Problem Solving Skills

The candidate will demonstrate an appropriate level of skill in the identification and selection of meaningful problems to be addressed in bioscience research, including the ability to defend said identifications and to design and develop appropriate methods to solve said problems as measured by rubric.

Integrated Knowledge of Bioscience

The candidate will demonstrate an appropriate level of knowledge of the current elements of the biosciences as related to disciplinary specialization and a more detailed understanding of the individual area of scholarship, including an appropriate familiarity with the research literature and the ability to evaluate and critique publications as measured by rubric.

MEASURES

Dissertation Review and Examination / Ph.D.

The thesis/dissertation review will be conducted by the Advisory Committee consisting of a minimum of three members (Master's level) or five members (Ph.D. level). The Committee members will review the document independently following the elements described in the attached rubric and score the document as Outstanding, Excellent, Acceptable or Unacceptable affording a means of measuring inter-rater/reviewer reliability. All members must find the document to be "acceptable."

The thesis / dissertation examination will be conducted through the presentation of the body of work described in the document in the form of a public seminar attended by the Advisory Committee. The presentation will be followed by a question and answer period. Committee members will review the presentation following the elements in the attached rubric as a means of measuring the oral and visual communication skills of the student affording a means of inter-rater/reviewer reliability. Committee members will vote to pass or fail the student on the performance with two or more votes to fail resulting in the overall failure of the examination.

Oral Candidacy Examination / Ph.D.

The oral candidacy examination will be conducted by the Advisory Committee consisting of a minimum of five members (Ph.D. level) with an additional *ad hoc* member, appointed by the Office of Graduate Education, who serves as the formal Chair of the examination. The examination will consist of a short oral presentation of a description of a research project, based on a document prepared by the student and distributed in advance to the examiner. The Committee will review the presentation (both written and oral) following the elements described in the attached rubrics affording a means of inter-rater reviewer reliability. Following the presentation the examining Committee will question the student on both the description presented as well as core elements of knowledge in the discipline. Student performance will be assessed to be adequate (pass) or not adequate (fail) by each member of the Committee based on the individual assessment of the components of the examination as described. Two or more votes to fail results in overall failure of the examination.

Dissertation Examination / Ph.D.

The dissertation examination will be conducted by the Advisory Committee consisting of a minimum of five members, the faculty Advisor serving as the Chair of the examination. The examination will consist of an oral presentation of the research project, based on the dissertation document prepared by the student and distributed in advance to the examiners. Following the presentation the examining Committee will question the student on the research project as presented in the dissertation. The Committee will review the presentation (both written and oral) following the elements described in the attached rubrics affording a means of inter-rater reviewer reliability. Student performance will be assessed to be adequate (pass) or not adequate (fail) by each member of the Committee based on the individual assessment of the components of the examination as described. Two or more votes to fail results in overall failure of the examination.

School of Medicine

Descriptive Rubrics for Learning Objectives for Research-Based Ph.D. Programs

1. Oral Communication

The candidate will demonstrate the achievement of an appropriate level of oral communication skills with respect to the content, organization, logical flow, presentation and appropriate use of language incorporating the use of visual aids, as measured by rubric.

Unsatisfactory - Topics are poorly developed with limited or poorly presented supporting details; presentation is unfocussed with limited relationship of aims and supporting information; speaker displays inadequate/inappropriate use of vocabulary, eye contact, posture, presentation appears unpracticed; visual materials poorly support points in the presentation; speaker fails to appropriately address questions

Satisfactory - Topics are adequately developed with inclusion of supporting materials; presentation is appropriately organized and is inclusive of aims and supporting information; speaker appears proficient in presentation skills though occasional flaws are present; presentation is adequately paced with clear exposition and logical presentation; visual materials support points in the presentation; speaker addresses questions adequately

Exemplary - Topic is well developed, effectively supported by relevant information; organization of presentation reflects creation of a well-structured framework; speaker displays consistent use of correct grammar and vocabulary and professional delivery, including eye contact and physical demeanor; visual materials are effective in supporting and enhancing the presentation; speaker addresses questions carefully and thoroughly, integrating additional information in responses

2. Written Communication

The candidate will demonstrate the achievement of an appropriate level of written communication skill with respect to grammar, syntax, spelling and use of vocabulary to effectively present information including the use of figures, tables and citations as measured by rubric.

Unsatisfactory - Document contains numerous grammar, syntax and spelling errors; use of vocabulary is inadequate; content is incomplete and / or inadequately organized to communicate message; presentation of figures and tables disjointed and confusing and / or displays absence / inappropriate use of citations

Satisfactory - Rules of grammar, syntax and spelling are followed with minimal errors; use of vocabulary is appropriate; content is adequately organized to communicate message; presentation of figures and tables provides an enhancement of the message in the presentation; citations are appropriately presented

Exemplary - Rules of grammar, syntax and spelling are consistently followed; vocabulary enhances communication of message; content is creatively organized with smooth transitions in the presentation of the message; use of figures and tables reflects an analysis of effective means of supporting message; citations are appropriately presented

3. Experimental Design

The candidate will demonstrate the achievement of an appropriate level of competence in the ability to appraise, modify and / or create and implement experimental protocols and to design and develop experiments as measured by rubric.

Unsatisfactory - Student fails to recognize limitations in the design of experimental protocols that compromise their suitability for productive research; student displays limited ability to adopt protocol descriptions for experiment and data acquisition; student lacks the level of technical skill to safely pursue unsupervised experimental work

Satisfactory - Student displays appropriate ability to identify experimental protocols appropriate to the research objective; student displays appropriate technical ability to implement protocols for data acquisition

Exemplary - Student displays ability to identify and select experimental protocols most appropriate to the research objective (may include the modification of established procedures); student displays appropriate technical ability to implement protocols for data acquisition

4. Problem Solving Skills

The candidate will demonstrate an appropriate level of skill in the identification and selection of meaningful problems to be addressed in bioscience research, including the ability to defend said identifications and to design and develop appropriate methods to solve said problems as measured by rubric.

Unsatisfactory - Student does many of the following: misinterprets or inaccurately evaluates relevant information; fails to acceptably explain procedures and/or results as related to reasons and claims; does not appropriately evaluate clear alternative explanations; draws unwarranted or fallacious conclusions; does not link evidence or reasoned analysis to claims in an appropriate manner

Satisfactory - Student consistently does most of the following in an appropriate fashion: identifies the appropriate reasons and claims (objective and hypothesis) related to the problem; accurately evaluates

relevant information available including presentation of methodology, data reduction and presentation, reference citations, statements and questions, etc.; analyzes the relation of the information to the reasons and claims, including (as appropriate) alternative explanations; draws warranted, non-fallacious conclusions; follows development of evidence to reasoned conclusion

Exemplary - Student consistently does the following in an appropriate fashion: identifies the appropriate reasons and claims (objective and hypothesis) related to the problem; accurately evaluates relevant information available including presentation of methodology, data reduction and presentation, reference citations, statements and questions, etc.; independently analyzes and evaluates the relation of the information to the reasons and claims, including (as appropriate) alternative explanations; draws warranted, non-fallacious and judicious conclusions; follows development of evidence to reasoned conclusion

5. Integrated Knowledge of Bioscience

The candidate will demonstrate an appropriate level of knowledge of the current elements of the biosciences as related to disciplinary specialization and a more detailed understanding of the individual area of scholarship, including an appropriate familiarity with the research literature and the ability to evaluate and critique publications as measured by rubric.

Unsatisfactory - Student demonstrates knowledge of factual material limited to a level appropriate to a baccalaureate graduate in the sciences; knowledge of bioscience related to the student's research area is unrelated to the current research literature

Satisfactory - Student demonstrates ability to apply fundamental concepts to advanced topics in bioscience and ability to relate the current research literature to her or his area of research

Exemplary - Student demonstrates ability to apply fundamental concepts to advanced topics in bioscience and a command of the current research literature related to her or his area of research including the ability to relate the literature to the student's research product

Program Performance Evaluation

Student's Name _____ Student ID No.: V _____

Date: _____ Program: _____ Degree: _____

	Unsatisfactory (1)	Satisfactory (2)	Exemplary (3)
Demonstrates Oral Communication Skills			
Demonstrates Written Communication Skills			
Displays Competence in Experimental Design			
Demonstrates Problem Identification and Solving Skills			
Displays Integrated Knowledge of Bioscience			
Overall			

Comment (optional):

Written Candidacy Examination Scoring Rubric

1. Identifies Appropriate Background / Existing Information

Unacceptable - Weak or inappropriate information related to problem/question is presented; lack of appropriate citations

Acceptable – Appropriate information related to problem / question is presented with appropriate citations

Excellent - Information presented related to problem / question displays expanded scope and relevance

Outstanding - Information presented displays expanded scope and relevance and is organized to enhance response to the problem / question presented

2. Presentation, Assessment and Analysis of Supporting Evidence

Unacceptable - Confused presentation of information and evidence in support of answer(s)

Acceptable – Organization of evidence and analysis is generally clear but may contain flaws

Excellent - Organization of evidence and analysis reflects clear relationships of information supporting response

Outstanding – Organization of evidence and analysis is exceptionally clear in showing relationships of information supporting response including an indication of the relative importance of components of the evidence presented

3. Develops, Communicates and Explains Answers Clearly and Effectively

Unacceptable - Response is not supported by evidence or evidence related to the answer given

Acceptable - Response incorporates evidence appropriate to the problem / question; demonstrates ability to organize evidence to support response though logical presentation may be flawed

Excellent – Answers are consistently well developed with appropriate evidence and / or examples presented in support; demonstrates ability to combine elements of evidence in creative ways to construct a logical and effective answer; some inconsistencies may be present

Outstanding – Answers demonstrate skills in logic and creativity in the selection of evidence including an evaluation of the relative merit of sources, an appropriate weighting of sources which are combined clearly to provide a logical and effective response

4. Uses Appropriate Grammar, Vocabulary and Style

Unacceptable –

Shows patterns of flaws in grammar, syntax and word choice that interferes with intended meaning or communication

Acceptable –

Demonstrates competent writing; may have occasional grammatical or syntax flaws. Flaws do not interfere with intended meaning or communication.

Excellent –

Displays command of grammar, selection of vocabulary and syntax; may have limited minor flaws

Outstanding –

Displays superior use of grammar, syntax and vocabulary to enhance meaning and communication

Written Examination Performance Evaluation

Student's Name _____ Student ID No.: V _____

Date: _____ Program: _____ Degree: _____

	Unacceptable (1)	Acceptable (2)	Excellent (3)	Outstanding (4)
Identifies Background / Existing Information				
Presents, Assesses and Analyzes Supporting Evidence				
Develops, Communicates and Explains Answers Effectively				
Uses Appropriate Grammar, Vocabulary and Style				
Overall				

Comment (optional):

Oral Candidacy Examination Scoring Rubric

1. Identification and Articulation of the Problem

Unacceptable - Presentation fails to adequately describe aims / objectives and provide relevance to existing bodies of knowledge; rationale for aims / objectives is absent or weak

Acceptable – Aims / objectives are presented; flaws in scope may be present; relevance to existing knowledge is described and an acceptable rationale for aims / objectives is presented

Excellent - Aims / objectives are clearly and succinctly presented; aims are appropriate in scope; a rationale for the aims / objectives is presented

Outstanding - Aims / objectives are structured to provide a logical framework to address the problem providing evidence of a thorough analysis of the existing bodies of knowledge; a compelling rationale for the aims / objectives is presented

2. Expression of Background / Existing Information

Unacceptable - Weak or inappropriate information related to problem/question is presented; lack of appropriate citations

Acceptable – Appropriate information related to problem / question is presented with appropriate citations

Excellent - Information presented related to problem / question displays expanded scope and relevance

Outstanding - Information presented displays expanded scope and relevance and is organized to enhance response to the problem / question presented showing evidence of a critique of prior work on the problem

3. Presentation, Assessment and Analysis of Supporting Evidence

Unacceptable - Confused presentation of information and evidence in support of proposal / presentation

Acceptable – Organization of evidence and analysis is generally clear but may contain flaws

Excellent - Organization of evidence and analysis reflects clear relationships of information supporting proposal / presentation

Outstanding – Organization of evidence and analysis is exceptionally clear in showing relationships of information supporting proposal / presentation including an indication of the relative importance of components of the evidence presented; critical assessment of existing information is evident

4. Develops, Communicates and Explains Project Plan

Unacceptable - Expression of relationship of project plan to aims / objectives is weak or inappropriate; relation of plan in support of elements of hypothesis is flawed

Acceptable - Project plan addresses aims / objectives is appropriate; elements of project plan may be flawed with respect to the strength of data acquisition supporting elements of hypothesis

Excellent - Project plan presentation clearly addresses aims and objectives; components of plan related to elements of hypothesis are logically presented with specific identification of the basis for selection of approaches

Outstanding – Project plan presentation displays evidence of creative approaches to meeting the aims / objectives including the selection and justification of components of the plan; the framework of the project presented provides a logical and convincing approach; alternative approaches may be presented

5. Displays Mastery of Subject Matter

Unacceptable - Student demonstrates knowledge of factual material limited to a level appropriate to a baccalaureate graduate in the sciences; knowledge of bioscience related to the student's research area is unrelated to the current research literature

Acceptable - Student demonstrates advanced knowledge of factual material consistent with graduate level training; displays an awareness of the research literature in the student's research area

Excellent - Student demonstrates ability to apply fundamental and advanced concepts to topics in bioscience and ability to relate the current research literature to her or his area of research

Outstanding - Student demonstrates ability to apply fundamental concepts to advanced topics in bioscience and a command of the current research literature related to her or his area of research; evidence of critical assessment and synthesis of elements of bioscience is apparent

6. Addresses Questions Appropriately

Unacceptable – Limited awareness of expectations of examiner; consistently fails to be appropriately responsive independently; structure of responses weak and/or difficult to follow

Acceptable - Generally aware of expectations of examiner; generally independently responsive to questions with occasional prompting or “leading” required; structure of responses adequate; some clarification / expansion of answers may be required

Excellent - Aware of expectations of examiner; seeks clarification if warranted; independently responsive to questions with limited need for prompts; structure of responses provides evidence of reflective organization of information

Outstanding - Displays informed awareness of expectations of examiner; independently responsive to questions; structure and breadth of content of responses provides evidence of reflective and creative organization of information; evidence of creative synthesis of information suggested / related to questions

7. Demonstrates Ability to Synthesize Information Creatively

Unacceptable - Confused presentation of information and evidence in support of answer(s)

Acceptable – Organization of evidence and analysis is generally clear but may contain flaws

Excellent - Organization of evidence and analysis reflects clear relationships of information supporting response

Outstanding – Organization of evidence and analysis is exceptionally clear in showing relationships of information supporting response including an indication of the relative importance of components of the evidence presented and a critical assessment / analysis of the validity of the information.

Oral Candidacy Examination Performance Evaluation

Student’s Name _____ Student ID No.: V _____

Date: _____ Program: _____ Degree: _____

	Unacceptable (1)	Acceptable (2)	Excellent (3)	Outstanding (4)
Identifies and articulates problem				
Discusses background/existing information				
Presents, assesses and analyzes supporting evidence				
Develops, communicates and explains project plan				
Displays mastery of subject matter				
Addresses questions appropriately				
Demonstrates ability to synthesize information creatively				
Overall				

Comment (optional):

**Oral Examination Performance Evaluation
(Ph.D. Candidacy, Thesis / Dissertation Defense)**

Student's Name _____ **Student ID No.:** V _____

Date: _____ **Program:** _____ **Degree:** _____

Examination Type: _____

	Unacceptable (1)	Acceptable (2)	Excellent (3)	Outstanding (4)
Identifies and articulates problem				
Discusses background/existing information				
Presents, assesses and analyzes supporting evidence				
Develops, communicates and explains project plan				
Displays mastery of subject matter				
Addresses questions appropriately				
Demonstrates ability to synthesize information creatively				
Overall				

Comment (optional):

Table 1. The Characteristics of Dissertations

Below are the criteria the focus group members specified for each level of dissertation quality.

Outstanding	Very Good
<ul style="list-style-type: none">• Is original and significant, ambitious, brilliant, clear, clever, coherent, compelling, concise, creative, elegant, engaging, exciting, interesting, insightful, persuasive, sophisticated, surprising, and thoughtful• Is very well written and organized• Is synthetic and interdisciplinary• Connects components in a seamless way• Exhibits mature, independent thinking• Has a point of view and a strong, confident, independent, and authoritative voice• Asks new questions or addresses an important question or problem• Clearly states the problem and why it is important• Displays a deep understanding of a massive amount of complicated literature• Exhibits command and authority over the material• Argument is focused, logical, rigorous, and sustained• Is theoretically sophisticated and shows a deep understanding of theory• Has a brilliant research design• Uses or develops new tools, methods, approaches, or types of analyses• Is thoroughly researched• Has rich data from multiple sources• Analysis is comprehensive, complete, sophisticated, and convincing• Results are significant• Conclusion ties the whole thing together• Is publishable in top-tier journals• Is of interest to a larger community and changes the way people think• Pushes the discipline's boundaries and opens new areas for research	<ul style="list-style-type: none">• Is solid• Is well written and organized• Has some original ideas, insight• Has a good question or problem that tends to be small and traditional• Is the next step in a research program (good normal science)• Shows understanding and mastery of the subject matter• Has a strong, comprehensive, and coherent argument• Includes well-executed research• Demonstrates technical competence• Uses appropriate (standard) theory, methods, and techniques• Obtains solid, expected results or answers• Misses opportunities to completely explore interesting issues and connections• Makes a modest contribution to the field but does not open it up

Acceptable

- Is workmanlike
- Demonstrates technical competence
- Shows the ability to do research
- Is not very original or significant
- Is not interesting, exciting, or surprising
- Displays little creativity, imagination, or insight
- Writing is pedestrian and plodding
- Has a weak structure and organization
- Is narrow in scope
- Has a question or problem that is not exciting—is often highly derivative or an extension of the adviser's work
- Displays a narrow understanding of the field
- Reviews the literature adequately—knows the literature but is not critical of it or does not discuss what is important
- Can sustain an argument, but the argument is not imaginative, complex, or convincing
- Demonstrates understanding of theory at a simple level, and theory is minimally to competently applied to the problem
- Uses standard methods
- Has an unsophisticated analysis—does not explore all possibilities and misses connections
- Has predictable results that are not exciting
- Makes a small contribution

Unacceptable

- Is poorly written
- Has spelling and grammatical errors
- Has a sloppy presentation
- Contains errors or mistakes
- Plagiarizes or deliberately misreads or misuses sources
- Does not understand basic concepts, processes, or conventions of the discipline
- Lacks careful thought
- Looks at a question or problem that is trivial, weak, unoriginal, or already solved
- Does not understand or misses relevant literature
- Has a weak, inconsistent, self-contradictory, unconvincing, or invalid argument
- Does not handle theory well, or theory is missing or wrong
- Relies on inappropriate or incorrect methods
- Has data that are flawed, wrong, false, fudged, or misinterpreted
- Has wrong, inappropriate, incoherent, or confused analysis
- Includes results that are obvious, already known, unexplained, or misinterpreted
- Has unsupported or exaggerated interpretation
- Does not make a contribution

Table 2. Some Dimensions of the Different Components of the Generic Dissertation

The following dimensions emerged from the analysis of the results of the study described in this article.

Component 1: Introduction

The introduction

- Includes a problem statement
- Makes clear the research question to be addressed
- Describes the motivation for the study
- Describes the context in which the question arises
- Summarizes the dissertation's findings
- Discusses the importance of the findings
- Provides a roadmap for readers

Component 2: Literature Review

The review

- Is comprehensive and up to date
- Shows a command of the literature
- Contextualizes the problem
- Includes a discussion of the literature that is selective, synthetic, analytical, and thematic

Component 3: Theory

The theory that is applied or developed

- Is appropriate
- Is logically interpreted
- Is well understood
- Aligns with the question at hand

In addition, the author shows comprehension of the theory's

- Strengths
- Limitations

Component 4: Methods

The methods applied or developed are

- Appropriate
- Described in detail
- In alignment with the question addressed and the theory used In addition, the author demonstrates
 - An understanding of the methods' advantages and disadvantages
 - How to use the methods

Component 5: Results or Analysis

The analysis

- Is appropriate
- Aligns with the question and hypotheses raised
- Shows sophistication
- Is iterative

In addition, the amount and quality of data or information is

- Sufficient
- Well presented
- Intelligently interpreted

The author also cogently expresses

- The insights gained from the study
- The study's limitations

Component 6: Discussion or Conclusion

The conclusion

- Summarizes the findings
- Provides perspective on them
- Refers back to the introduction
- Ties everything together
- Discusses the study's strengths and weaknesses
- Discusses implications and applications for the discipline
- Discusses future directions for research

Thesis/Dissertation Evaluation

Student's Name _____ Student ID No.: V _____

Date: _____ Program: _____ Degree: _____

	Unacceptable (1)	Acceptable (2)	Excellent (3)	Outstanding (4)
Introduction – Provides a Problem Statement, Context, Strategy and Overall Findings				
Literature Review – Incorporates a Current Summary and Analysis of Literature				
Theory – Explains the Approach to Addressing the Problem				
Methods – Provides Adequate Description Related to Addressing Problem				
Results / Analysis – Appropriate Presentation of Data and Alignment with Stated Problem				
Discussion / Conclusion – Summarizes and Integrates Results; Discusses Implications and Future Direction				
Overall				

Comments (optional):