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Assessment of Student Learning - Microbiology & Immunology Department

Ph.D. Program Mission Statement:

The Ph.D. program in the Department of Microbiology and Immunology will provide students with formal classroom instruction, mentored training in laboratory research, and other educational experiences that will prepare them for advanced post-doctoral training and careers as independent biomedical scientists.

Goal A. Students will acquire an appropriate knowledge base.

Objective 1. Students will demonstrate an appropriate knowledge base with respect to biomedical science, and to the fields of microbiology and immunology in particular.

Performance criteria:

Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research. (see Objective A, pages 8-9)

Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology. (see Objective B, pages 8-9)

Assessment methods:

Students will take a comprehensive oral examination (parts I and II) administered by the entire departmental faculty. Students will be examined to assess the level of their knowledge in the areas described above. A written evaluation incorporating faculty input will be made with respect to these criteria. This knowledge base should also be reflected in their journal club presentations and in the capstone dissertation that they write and defend.

Objective 2. Students will demonstrate a thorough knowledge base of the field in which their research project is based.

Performance criteria:

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Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research. (see Objective C, pages 8-9)

Assessment methods: Students will demonstrate understanding of their specialized field of research in four ways.

Journal club presentations and participation should reflect the student's knowledge base.

After their first year, students will present an annual public seminar based on their research projects that will include a review of the current literature pertinent to their project. Following the seminar, a meeting with their research advisor and advisory committee to review student progress will generate both verbal and written assessment of student performance with respect to this criterion.

Students wishing to bypass the master's degree program and enter the doctoral program may do so by taking and passing the Departmental Qualifying Diagnostic Examination in which they propose and defend a research project that they plan to undertake. Students entering directly into the doctoral program must take and pass a Doctoral Graduate Student Preliminary Examination in which they propose and defend a research project that they plan to undertake.

Students will write a comprehensive review of the field of research in which they are engaged and will defend their understanding of the field and of their research as a part of their final dissertation. Following a public defense, the student's advisory committee will meet with the student to evaluate the student's understanding in light of contemporary knowledge and laboratory practice, and prepare a written assessment of the student's performance with respect to this criterion.

Goal B. Students will learn to critically evaluate data.

Objective 1. Students will demonstrate the ability to analyze published scientific data.

Performance criteria:

Students will be able to explain and critique the rationale(s) for experimental approaches to assigned problems drawn from the current literature. (see Objective D, pages 8-9)

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Students will be able to interpret published data drawn from the current literature and critique the hypotheses generated from that data. (see Objective E, pages 8-9)

Students will be able to explain the theory and application of current methodologies appropriate to assigned problems drawn from the current literature (see Objective F, pages 8-9)

Assessment methods:

Students will critique the current literature in regularly assigned journal clubs. Written and verbal assessment of student performance by faculty will follow with respect to these criteria.

Students will present an annual public seminar based on their individual research projects that will include a review of the current literature pertinent to their project. Following the seminar, a meeting (on at least an annual basis) with their research advisor and advisory committee will generate both verbal and written assessment of student performance with respect to these criteria.

Students wishing to bypass the master's degree program and enter the doctoral program may do so by taking and passing the Departmental Qualifying Diagnostic Examination in which they propose and defend a research project that they plan to undertake. Students entering directly into the doctoral program must take and pass a Doctoral Graduate Student Preliminary Examination in which they propose and defend a research project that they plan to undertake.

Students will design, write and verbally defend a proposed research project (Comprehensive Examination I) on a topic drawn from the current literature other than that in which they are engaged. Written and verbal assessment of student performance with respect to these criteria will be generated by the student's advisory committee.

Objective 2. Students will demonstrate the ability to generate and analyze data.

Performance criteria:

Students will design and conduct experimental research projects, based on defined and informative questions, incorporating appropriate positive and negative controls. (see Objective G, pages 8-9)

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Students will learn and apply research techniques appropriate to their research project. (see Objective H, pages 8-9)

Students will interpret their experimental data, and demonstrate an understanding of role of appropriate positive and negative controls in the analysis of their data. (see Objective I, pages 8-9)

Assessment methods:

Students will present an annual public seminar based on their individual research projects in which they are required to describe generation and analysis of their data.

In addition to the seminar, students will undergo reviews of their research progress on at least an annual basis with their research advisor and advisory committee that will include both verbal and written assessment of student performance with respect to these criteria.

A terminal evaluation of the student's research data and analysis will require the writing and defense of a dissertation containing experimental results suitable for publication in a professional journal. The dissertation will be defended in a public seminar and in a meeting with the student's research advisor and advisory committee. Students will be evaluated in verbal and written form with respect to these criteria.

Goal C. Students will learn to formulate and test hypotheses and to design informative and properly controlled experiments to test those hypotheses.

Objective 1. Students will demonstrate the ability to formulate logic-based hypotheses and to formulate questions or predictions that would test those hypotheses experimentally.

Performance criteria:

Students will design a logically constructed series of experiments, anticipating potential outcomes and how they will impact subsequent experiments. They will be required to demonstrate an ability to "problem-solve" in devising experimental approaches. In addition, students will have to anticipate potential experimental failures and suggest alternative approaches. (see Objective J, pages 8-9)

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Students will use their data to formulate hypotheses and to make logical predictions based on those hypotheses. (see Objective K, pages 8-9)

Students will design and perform subsequent experiments to test those predictions. (see Objective L, pages 8-9)

Assessment methods:

Students will present an annual public seminar based on their individual research projects in which they are required to describe the hypotheses they have generated through analysis of their data, the predictions that can logically be made, and how they have tested (or propose to test) those predictions.

Students wishing to bypass the master's degree program and enter the doctoral program may do so by taking and passing the Departmental Qualifying Diagnostic Examination in which they propose and defend a research project that they plan to undertake. Students entering directly into the doctoral program must take and pass a Doctoral Graduate Student Preliminary Examination in which they propose and defend a research project that they plan to undertake.

Students will undergo reviews of research progress on at least an annual basis with their research advisor and advisory committee that will include verbal and written assessment of their performance with respect to these criteria.

A terminal evaluation of the student's research data and analysis will require the writing and defense of their dissertation. The dissertation will be defended in a public seminar and in a subsequent meeting with the student's research advisor and advisory committee. Students will be evaluated in verbal and written form with respect to these criteria.

Goal D. Students will learn to present and publish their experimental data.

Objective 1. Students will demonstrate the ability to present and defend their ideas, findings and analyses in written form.

Performance criteria:

Students will demonstrate the ability to present and defend the background and rationale for their work. (see Objective M, pages 8-9)

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Students will demonstrate the ability to describe their experimental procedures and results. (see Objective N, pages 8-9)

Students will demonstrate the ability to draw conclusions and construct logical hypotheses from their data. (see Objective O, pages 8-9)

Students will demonstrate the ability to discuss the significance of their results and to place them within the context of the results from other investigators (see Objective P, pages 8-9)

Assessment methods:

In addition to their annual research seminar, students will undergo reviews of their research progress on at least an annual basis with their research advisor and advisory committee that will include their contributions in the generation of posters to be presented at professional meeting and/or manuscripts to be submitted.

A final summation of the student's research data and analysis will result in the writing of a dissertation containing experimental results of a level suitable for publication in a professional journal. The written form of the dissertation will be defended in a meeting with the student's research advisor and advisory committee. Students will be evaluated in verbal and written form with respect to these criteria.

Objective 2. Students will demonstrate the ability to present and defend their ideas, findings and analyses in oral form.

Performance criteria:

Students will demonstrate the ability to present and defend the background and rationale for their work (see Objective M, pages 8-9)

Students will demonstrate the ability to describe their experimental procedures and results (see Objective N, pages 8-9)

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Students will demonstrate the ability to draw conclusions and construct logical hypotheses from their data (see Objective O, pages 8-9)

Students will demonstrate the ability to discuss the significance of their results and to place them within the context of the results from other investigator (see Objective P, pages 8-9)

Assessment methods:

Students will present an annual public seminar based on their individual research projects in which they are required to describe the hypotheses they have generated through analysis of their data, the predictions that can logically be made, and how they have tested or propose to test those predictions. Students will also present their research orally at professional meetings as occasions permit.

In addition to the seminars, students will undergo reviews of their research progress on at least an annual basis with their research advisor and advisory committee that will include a verbal defense of the material presented in the seminar. A written report of the student's performance with respect to these criteria will be prepared.

A final summation of the student's research data and analysis will result in the oral defense of a dissertation in a public seminar and in a subsequent meeting with the student's research advisor and advisory committee. Students will be evaluated in verbal and written form with respect to these criteria.

Summary of Assessment Occasions and Objectives

Assessment Occasions	Objectives (see listing below)															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Journal Clubs																
Qualifying or Preliminary Examination																
Comprehensive Examination I																
Comprehensive Examination II																
Research Seminars																
Advisory Committee Meetings																
Written dissertation																
Defense of dissertation																

Qualifying or Preliminary Examination - student prepares a written proposal, in the style of a grant application, for a research project that they propose to carry out. The proposal is then defended orally in an open seminar and in a meeting with the student’s advisory committee.

Comprehensive Examination I - student prepares a written proposal for a research project (in an area other than that in which they are working) in the style of a grant application. The proposal is then defended orally in an open seminar and in a meeting with the student’s advisory committee.

Comprehensive Examination II - The student undergoes an oral examination by the entire departmental faculty and non-departmental members of his/her advisory committee.

Objectives:

- A. Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research.
- B. Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology.
- C. Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research.
- D. Students will be able to explain and critique the rationales(s) for experimental approaches to assigned problems drawn from the current literature.
- E. Students will be able to interpret published data drawn from the current literature and critique the hypotheses generated from that data.
- F. Students will be able to explain the theory and application of current methodologies appropriate to assigned problems drawn from the current literature.

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- G. Students will design and conduct experimental research projects, based on defined and informative questions, incorporating appropriate positive and negative controls.
- H. Students will learn and apply research techniques appropriate to their research project.
- I. Students will interpret their experimental data, and demonstrate an understanding of role of appropriate positive and negative controls in the analysis of their data.
- J. Students will design a logically constructed series of experiments, anticipating potential outcomes and how they will impact subsequent experiments. They will be required to demonstrate an ability to “problem-solve” in devising experimental approaches. In addition, students will have anticipate potential experimental failures and to suggest alternative approaches.
- K. Students will use their data to formulate hypotheses and to make logical predictions based on those hypotheses.
- L. Students will design and perform subsequent experiments to test those predictions.
- M. Students will demonstrate the ability to present and defend the background and rationale for their work.
- N. Students will demonstrate the ability to describe their experimental procedures and results.
- O. Students will demonstrate the ability to draw conclusions and construct logical hypotheses from their data.
- P. Students will demonstrate the ability to discuss the significance of their results and to place them within the context of the results from other investigators.

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Evaluator _____ Date _____ Student _____

Advisory Committee Student Assessment Form – Qualifying Diagnostic Examination Part I

Objectives:

Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology.

Outstanding Excellent Adequate Inadequate N/A

Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research.

Outstanding Excellent Adequate Inadequate N/A

Students will design a logically constructed series of experiments, anticipating potential outcomes and how they will impact subsequent experiments. They will be required to demonstrate an ability to “problem-solve” in devising experimental approaches. In addition, students will have anticipate potential experimental failures and to suggest alternative approaches.

Outstanding Excellent Adequate Inadequate N/A

Specific Comments:

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Evaluator _____ Date _____ Student _____

Advisory Committee Student Assessment Form – Comprehensive Examination Part I

Objectives:

Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology.

Outstanding Excellent Adequate Inadequate N/A

Students will be able to explain and critique the rationales(s) for experimental approaches to assigned problems drawn from the current literature

Outstanding Excellent Adequate Inadequate N/A

Students will be able to interpret published data drawn from the current literature and critique the hypotheses generated from that data

Outstanding Excellent Adequate Inadequate N/A

Students will be able to explain the theory and application of current methodologies appropriate to assigned problems drawn from the current literature.

Outstanding Excellent Adequate Inadequate N/A

Specific Comments:

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Evaluator _____ Date _____ Student _____

Advisory Committee Student Assessment Form – Comprehensive Examination Part II

Objectives:

Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology.

Outstanding Excellent Adequate Inadequate N/A

Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research.

Outstanding Excellent Adequate Inadequate N/A

Specific Comments:

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Evaluator _____ Date _____ Student _____

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Advisory Committee Student Assessment Form – Research Seminar Performance **Review of Student Progress**

Objectives:

Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research.

Outstanding Excellent Adequate Inadequate N/A

Students will be able to explain and critique the rationales(s) for experimental approaches to assigned problems drawn from the current literature

Outstanding Excellent Adequate Inadequate N/A

Students will be able to interpret published data drawn from the current literature and critique the hypotheses generated from that data

Outstanding Excellent Adequate Inadequate N/A

Students will be able to explain the theory and application of current methodologies appropriate to assigned problems drawn from the current literature.

Outstanding Excellent Adequate Inadequate N/A

Students will design and conduct experimental research projects, based on defined and informative questions, incorporating appropriate positive and negative controls.

Outstanding Excellent Adequate Inadequate N/A

Students will learn and apply research techniques appropriate to their research project

Outstanding Excellent Adequate Inadequate N/A

Students will interpret their experimental data, and demonstrate an understanding of role of appropriate positive and negative controls in the analysis of their data.

Outstanding Excellent Adequate Inadequate N/A

Students will design a logically constructed series of experiments, anticipating potential outcomes and how they will impact subsequent experiments. They will be required to demonstrate an ability to “problem-solve” in devising experimental approaches. In addition, students will have anticipate potential experimental failures and to suggest alternative approaches.

Outstanding Excellent Adequate Inadequate N/A

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Students will use their data to formulate hypotheses and to make logical predictions based on those hypotheses.

Outstanding Excellent Adequate Inadequate N/A

Students will design and perform subsequent experiments to test those predictions.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to present and defend the background and rationale for their work.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to describe their experimental procedures and results.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to draw conclusions and construct logical hypotheses from their data.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to discuss the significance of their results and to place them within the context of the results from other investigators.

Outstanding Excellent Adequate Inadequate N/A

Specific Comments: *(include a listing of publications and oral/poster presentations at meetings)*

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Evaluator _____ Date _____ Student _____

Advisory Committee Student Assessment Form – Written Dissertation and Oral Defense

Objectives:

Students will demonstrate an appropriate level of understanding of the concepts and practical tools pertaining to basic biological principles, biochemistry and molecular biology, statistics, and ethical considerations in biomedical research.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate an appropriate level of understanding of the concepts and methods pertaining to microbiology and immunology.

Outstanding Excellent Adequate Inadequate N/A

Students must demonstrate an appropriate level of understanding of the historical background, theoretical concepts, state-of-the-art experimental practices, and consensus opinions pertaining to a specialized field of advanced microbiology or immunology in which they are conducting research.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to present and defend the background and rationale for their work.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to describe their experimental procedures and results.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to draw conclusions and construct logical hypotheses from their data.

Outstanding Excellent Adequate Inadequate N/A

Students will demonstrate the ability to discuss the significance of their results and to place them within the context of the results from other investigators.

Outstanding Excellent Adequate Inadequate N/A

Specific comments: