

# MOLECULAR MICROBIOLOGY & IMMUNOLOGY, PHD

## Introduction

The goal of the MMI doctoral program (<https://publichealth.jhu.edu/academics/phd-dept-of-molecular-microbiology-and-immunology/>) is to train independent scientists to take leading roles in advancing our understanding of the cellular and molecular mechanisms that drive infectious and immune diseases. The specific goals listed below are designed to foster ingenuity, creativity, and critical thinking in students that will enable them to recognize and solve key problems in infectious and immunological diseases of public health importance.

## Program Requirements

Course location and modality is found on the BSPH website (<https://www.jhsph.edu/courses/>).

There are several levels of requirements for the completion of the degree program: those set by the school, by the department, by the Thesis Advisory Committee (TAC), and by the thesis adviser. The degree requirements established by the School are contained in the Policy and Procedure Memoranda available at the Bloomberg School of Public Health (<https://my.jhsph.edu/>).

The requirements for MMI are explained below. A student's thesis adviser with the participation of the Thesis Advisory Committee (TAC) generally will set requirements regarding the preparation for, and completion of, the thesis or dissertation project.

## Advisers

Each student is assigned an MMI faculty member who will serve as their initial Academic Adviser during the first year of training. The Academic Adviser assists the student in navigating the first year by advising on the selection of appropriate courses, providing information concerning school and departmental policies, etc. The Academic Adviser is a temporary appointment and is typically replaced by the Thesis Adviser at some point during the first academic year. A student who wishes to change their Academic Adviser should contact the Student Coordinator who will consult the GPC.

Selection of a Thesis Adviser takes place after completion of laboratory rotations (see below), generally prior to June 1. After discussion with the prospective thesis adviser, the student should submit to the Student Coordinator a completed Thesis Adviser Selection form (available on the Departmental portal, <https://my.jhsph.edu/sites/MMI/academic-forms/default.aspx> signed by the prospective adviser for approval by the department Chair.

Note that MMI graduate students must perform thesis research in the laboratory of a faculty member who holds a primary appointment in MMI or in the laboratory of a JHU faculty member who holds a joint appointment in MMI and is designated as a trainer on an MMI training grant. **Requests for thesis advisers other than these will not be approved.**

Every effort will be made to accommodate a student's request to work with a specific faculty member for their thesis research. However, the department cannot guarantee that a student will be able to work in the laboratory that is selected as a first choice. In the event that a student's

first choice cannot be met, an alternative will be arranged in consultation with the student.

## Thesis Advisory Committees (TAC) and Individual Development Plans (IDP)

The Thesis Advisory Committee (TAC) meetings provide a structured opportunity for students to discuss scientific goals, research progress, and issues relevant to their project as well as to adopt an Individual Development Plan (IDP) that will support and monitor their professional and career development. The TAC, which is composed of a customized group of faculty members with expertise in the areas relevant to the student's research project, meets at least annually through the fourth year of the program and semiannually thereafter.

Each student is required to form a TAC during their second academic year. The initial TAC meeting should be scheduled by the end of the 4<sup>th</sup> term of year two and the meeting should take place no later than the end of the first term of year three. Students in their second year and beyond who do not complete the annual TAC meeting including the submission of the TAC/IDP Report will not be allowed to register in the first term of the following academic year. It is the responsibility of the student and their faculty adviser to schedule the annual meetings. The Student Coordinator should be informed of the anticipated date of the TAC meeting when it is scheduled. Note that a long lead time (months) may be needed to find a date when all TAC members are available for the meeting, and it is wise to begin the scheduling process early.

TACs consist of the student's Thesis Adviser and at least two faculty members with a primary appointment in MMI at the rank of assistant professor or higher. The highest-ranking MMI faculty member, other than the adviser, will serve as the committee chair. TACs can include additional members and participants from other departments/divisions of JHU and from other institutions are welcome. Inclusion and diversity are encouraged in TACs. Committee members should be jointly selected by the student and the thesis adviser.

TAC meetings are conducted in four parts in the following order:

**Introduction by the adviser.** With the student absent, the adviser should briefly introduce the student (thesis topic, year in the program, background, unusual career circumstances, or other relevant matters) and assess the student's performance relative to the adviser's expectations. Factors that may be impeding the student's progress should be raised and discussed. At the discretion of the TAC, these may be discussed with the student during the meeting.

**Review of the student's progress in the program and professional development,** guided by the points listed in Part B of the TAC/IDP and the experiences gained in the programs offered by the JHU Professional Development and Career Office (see page 28). Part B should be completed by the student before the meeting and furnished to the committee members at the meeting. As appropriate, the committee will discuss the student's responses to the points on the form and offer recommendations, advice, and insights into how the student might best approach their professional goals. Starting in the 3<sup>rd</sup> year special attention will be focused on the completion of the first author paper requirement. At the end of this discussion, the TAC Chair will summarize this discussion and note action items on the form. It is recognized that career goals evolve, and it is the intent that TAC/IDP reports will reflect, facilitate, and potentially guide that evolution, not constrain it. At the end of this discussion, the TAC/IDP form is signed by the committee and student and returned to the Student Coordinator.

**Discussion of the scientific aspects of the student's project**, beginning with a concise presentation by the student that summarizes the current status of the research project, research accomplishments during the previous year, and an outline of research plans for the coming year. The scientific discussion is intended to provide fresh perspectives on the project, overall guidance, potential technical solutions to difficulties that have arisen, and access to expertise in varied fields. This part of the TAC meeting will be summarized at the end of the discussion by the TAC Chair in Part A of the Thesis Advisory Committee and Individual Development Plan (TAC/IDP) Report form, available on the MMI portal: <https://my.jhsph.edu/sites/MMI/academic-forms/default.aspx>.

**Discussion with the student in the absence of the adviser.** At the conclusion of the discussion of the IDP, the adviser will leave the meeting to give the student an opportunity to evaluate the status of his project, the relationship with the adviser or the lab generally, and to identify measures that would enhance their educational and professional experience. Substantive issues that are revealed should be summarized in a confidential email from the TAC Chair to the GPC c/o the Student Coordinator. The TAC chair should also inform the adviser of matters that arose unless the student specifies that the discussion remains confidential.

## Annual Evaluation of Progress, Performance, and Mentoring

The principal element in the training and guidance of graduate students is the interaction with their Thesis Adviser. Such mentoring commonly occurs on an ongoing basis involving frequent informal discussions, lab meetings, etc. However, a formal mechanism of evaluation of performance and of satisfaction of both the adviser and student is valuable in many cases. Annual progress, performance, and mentoring meetings between each student and their mentor guided by the Annual Evaluation of Progress, Performance, and Mentoring (AEPPM) form ensure that such formal performance and satisfaction discussions occur in MMI. Once per year, a month prior to the TAC meeting, each student is required to complete this document (available on the MMI departmental portal) and to discuss it with their Thesis Adviser. Following that discussion, the form signed by the student and Thesis Adviser should be returned to the Student Coordinator. The signed form must be turned in prior to the TAC meeting. Completed forms are reviewed by the GPC with the object of identifying developing problems. This mechanism is intended to foster frank discussions between the student and adviser and will be of value only if the student's answers and the adviser's responses during the following discussions are honest. Note: A GPC committee member will be added to the TAC starting in year 5 if graduation is not scheduled.

## Laboratory Rotations

Rotation periods broaden a student's knowledge of laboratory techniques and skills, provide exposure to a variety of research areas, help in selecting a laboratory for thesis research, provide an opportunity for interaction with several faculty members, and develop the ability to carry out a research project. During a laboratory rotation, a student will be given a specific research problem of limited scope as their rotation exercise. At the end of the laboratory rotation term, the student will give a short oral presentation on the project at the Research Forum in Molecular Microbiology and Immunology (see below). Students are encouraged to discuss expectations (time and effort spent, etc.) with the rotation supervisor early in the rotation.

Doctoral students are required to rotate through at least three (3) laboratories of faculty members who hold primary appointments in MMI or who are designated as members of the MMI training faculty.

MMI ScM students who matriculate to the PhD program are required to complete a total of 3 rotations over the course of both programs. These rotations must be in different departmental laboratories.

Each laboratory rotation lasts about 8 weeks. The rotation starting and ending dates are listed in the table below. Because laboratory rotations do not correspond to standard academic terms, **students should register for PH.260.851 Laboratory Rotations during the second, third, and fourth terms.**

### 2023-2024 MMI Laboratory Rotation Schedule

Rotation Period	Dates	Register in Term
First	11/6/23 - 1/19/24	2
Second	1/22/24 - 3/15/24	3
Third	3/25/24 - 5/17/24	4

The selection of laboratories for rotations is the responsibility of the student. Students (with the assistance of their academic adviser) should identify potential laboratories for their rotations and consult with the faculty members in charge of these laboratories to arrange a rotation for a particular academic term.

Students may conduct rotations in addition to the three required to explore other laboratories or to learn particular laboratory techniques or skills. These extra rotations may be conducted in departmental laboratories or in labs outside the MMI training faculty. Because PhD students must conduct thesis research in a laboratory within MMI or in the laboratory of a designated MMI trainer, rotations outside such labs should **not** be considered a means for identifying potential thesis research laboratories.

It is expected that substantial time will be spent in the laboratory during each rotation. It is critical that the student and rotation supervisor discuss this issue and reach an agreement on their mutual expectations. In the case of questions on this point, seek the advice of the MMI Ombuds, the GPC chair, or any MMI faculty member.

At the conclusion of each rotation, the student and the rotation supervisor will complete a rotation report that will be turned in to the student coordinator. A copy of the form can be found on the MMI portal at: <https://my.jhsph.edu/sites/MMI/academic-forms/default.aspx>.

**NOTE: Animal protocols; radiation licenses; pathogen, and recombinant DNA registrations.** Any rotating student who participates in animal experiments must be added to the appropriate animal protocol before beginning work. While it is the responsibility of the Principle Investigator (PI) of the protocol, working with the PI prior to the start of the rotation to make sure the student is included in the protocol(s) will prevent costly delays. Students also must complete online animal research training and must enroll in the Animal Exposure Surveillance Program prior to beginning work. Students must also be added to radiation licenses, pathogen registration and recombinant DNA registration, and human IRBs by the PI as required. In general, training in procedures is required for work with these agents or human samples.

Once the POE has been passed (see pages 23-24), the student needs to complete a **Thesis Research Documentation Form** that will be sent from the Dean's Office, which must be filled out **within 6 months of passing the POE.** It is the student's responsibility to ensure that the necessary

research approvals are obtained (either IRB for human subjects research or ACUC for animal research) on the appropriate approved protocol(s). Retroactive research approval for research involving human subjects and/or animals **cannot**, under any circumstance, be granted. Failure to obtain research approval will prevent a student from publishing their thesis/dissertation.

MMI guidelines request that 1<sup>st</sup> year PhD students choose a research adviser by no later than June 1<sup>st</sup> to ensure that any payroll change deadlines are met.

### Research Forum and Laboratory Rotation Presentations

PhD students are required to give an oral presentation of their research. During the first year, the student will present the results of their rotation projects. These oral presentations will be delivered during the weekly Departmental Research Forum. Rotation presentations are 20 minutes long and thesis research presentations are 30 minutes long. Suggested organization of presentations:

1. Introduction - Present the background and rationale of the work and outline the working hypothesis.
2. Experimental Design - Describe the overall experimental approach.
3. Results/Discussion - Results should be presented in an organized, meaningful, and comprehensible manner.
4. Summary/Conclusion - Provide a short summary of the results and give an indication of future research directions.

An evaluation form (available from the departmental web portal and the TA) will be completed by two students and two faculty and returned to the student to provide constructive comments to improve future presentations.

Course location and modality is found on the BSPH website (<https://www.jhsph.edu/courses/>).

### Required Courses

All MMI required courses must be passed with a grade of A or B. Students not meeting that standard must repeat the relevant course(s) and pass with an A or B. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the GPC Chair. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School's Committee on Academic Standards.

First year students must register for **16-22 credits each term**. Students in their 2nd year and beyond should register for a maximum of 16 credits. First year students should register for PH.260.851 Laboratory Rotations in terms 2, 3, and 4. (See Laboratory Rotations (p. 2), above).

The required core curriculum necessitates that each student takes:

- Principles of Immunology I & II and the companion courses Topics in Immunology I & II.
- Coursework in 3 out of the 4 areas that focus on microbial biology and pathogenesis – Fundamentals of Virology, Pathogenesis of Bacterial Infections, Biology of Parasitology, and Vector Biology & Vector Borne Disease.
- Two molecular and cell biology courses taught at the School of Medicine – Molecular Biology & Genomics; Cell Structure & Dynamics.

- Cells-to-Society Learning Objectives (see table below).
- Completion of the R3 Certificate (see table below):
  - Please note that a minimum of two core courses from the R3 Curriculum are required for all MMI doctoral students, regardless of their chosen track.
  - To fulfill this R3 minimum requirement students are allowed to choose two out of three from the following R3 core courses, which are offered several times per year:
    - How do we know? Theory & Practice of Science (260.700)
    - Anatomy of Scientific Error (260.701)
    - Causation (260.844)
- The R3 Certificate is required to be completed by all MMI doctoral students within their first 2-3 years who want to be considered for an F31 fellowship (<https://researchtraining.nih.gov/programs/fellowships/F31/>) under the MMI training grant or for the Katharine E. Welsh Scholarship award of the MMI R<sup>3</sup>IM PhD Track.

In addition, students are required to register for Research Forum in MMI (Monday noon research presentations) and Seminars in Research in MMI (Thursday departmental noon seminar) each term.

Outlined below is an example of a representative curriculum taken in the first and second years of the program. Depending on interests and background, the details of a student's specific curriculum can vary from the prototype outlined below. Students should consult their academic adviser prior to registering for courses.

**NOTE: Students in the R<sup>3</sup>IM Track – go to R<sup>3</sup>IM Required Courses below.**

## Requirements for General PhD Program

### First-Year Course Requirements

Course	Title	Credits
<b>First Term</b>		
<b>Summer</b>		
Introduction to Online Learning: <a href="https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90">https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90</a> ( <a href="https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90/">https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90/</a> ) (non-credit)		
<b>First Term</b>		
PH.550.860	Academic & Research Ethics at BSPH	0
PH.260.623	Fundamental Virology	4
PH.260.607	Methods in life sciences, literature and practice	2
PH.260.611	Principles of Immunology I	4
PH.260.801	Topics in Immunology I	1
PH.260.700	How Do We Know? - Theory, History, and Practice of Science	3
(See R3 Course Offerings for a full list)		
PH.552.6XX	Cells-to-Society (p. 4)	Varies
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
<b>Credits</b>		<b>16</b>
<b>Second Term</b>		
PH.260.635	Biology of Parasitism	5
PH.260.612	Principles of Immunology II	3
PH.260.802	Topics in Immunology II	1

ME.260.709	Molecular Biology and Genomics (Molecular Biology and Genomics)	3
PH.260.607	Methods in life sciences, literature and practice	2
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice	3
(See R3 Course Offerings for a full list)		
PH.260.851	Laboratory Rotations (Variable credits)	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	Varies
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
<b>Credits</b>		<b>23-27</b>
<b>Third Term</b>		
PH.260.627	Pathogenesis of Bacterial Infections	4
ME.110.728	Cell Structure and Dynamics (Cell Structure and Dynamics)	3
PH.260.607	Methods in life sciences, literature and practice	2
PH.260.650	Vector Biology and Vector-Borne Diseases	3
PH.260.851	Laboratory Rotations (Variable credits)	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	Varies
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
<b>Credits</b>		<b>18-22</b>
<b>Fourth Term</b>		
PH.260.851	Laboratory Rotations (Variable credits)	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	Varies
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
<b>Credits</b>		<b>6-10</b>
<b>Total Credits</b>		<b>63-75</b>

Second year and beyond, PhD students should continue to register for a minimum of 16 credits per term, including courses (if any), 1 credit for Research Forum (260.821), 1 credit for Seminars in Research (260.822), and Thesis Research (260.820). PhD students must also register for summer term: 12 credits Summer Thesis Research (260.829.)

### Electives

PhD students are strongly advised to take at least one departmental advanced course during each of the third and fourth terms of their first year. The specific courses taken should be chosen after discussion between the student and their adviser. Generally, these courses will include at least one in the area in which the student expects to conduct their thesis research.

### Cells-to-Society Requirements for All Degree Programs

The Council on Education for Public Health (CEPH) requires didactic coursework covering and assessing 12 CEPH-defined Introductory Public

Health Knowledge Learning Objectives. It is important to emphasize that this is a School-level requirement of all degree programs.

The School's Committee on Academic Standards approved 12 online, 0.5 credit, mini-courses, graded S/U (satisfactory/unsatisfactory) that will cover each of the 12 Learning Objectives (see table below). Each of the mini-courses consists of 3-5, 30-40 minute presentations with an accompanying assessment. **Note:** Certain learning objectives can be fulfilled by taking a course that covers this material instead of the mini-course (see the right-hand column in the table below).

Each of the C2S mini-courses will be offered several times each year, starting in the summer term. The 2022-2023 schedule is here: <https://publichealth.jhu.edu/academics/course-directory/schedule-of-cells-to-society-course-offerings> (<https://publichealth.jhu.edu/academics/course-directory/schedule-of-cells-to-society-course-offerings/>).

Please note that for the presentation of these mini-courses, each term has been split into an A section covering the first 4 weeks of the term and a B section that covers the second 4 weeks of the term.

**These 12 mini-courses must be completed by the end of the first academic year.**

Code	Title	Credits
PH.552.601	Foundational Principles of Public Health	0.5
PH.552.602	The Role of Quantitative Methods in Public Health (or take any of the following courses: 140.611-12 (term 1 and 2) or 140.615-16 (term 3 and 4) or 260.705 (term 3 or term 4))	0.5
PH.552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health (or take 260.700 (term 1 or term 3))	0.5
PH.552.604	Causes and Trends in Morbidity and Mortality (or take 260.600 (summer, credit in term 1) or 260.844 (term 2 or term 4))	0.5
PH.552.605	The Science of Primary Secondary and Tertiary Prevention in Population Health	0.5
PH.552.606	The Critical Importance of Evidence in Advancing Public Health Knowledge (or take 260.700 (term 1 or term 3))	0.5
PH.552.607	Essentials of Environmental Health	0.5
PH.552.608	Biologic, Genetic and Infectious Bases of Human Disease (or take 260.600.81 in summer (credit in term 1))	0.5
PH.552.609	Psychological and Behavioral Factors That Affect A Population's Health	0.5
PH.552.610	The Social Determinants of Health	0.5
PH.552.611	Globalization and Population Health (or take 260.844 (term 2 or term 4))	0.5
PH.552.612	Essentials of One Health	0.5
<b>Total Credits</b>		<b>6</b>

### Second-Year Course Requirements

Course	Title	Credits
<b>First Term</b>		
PH.550.600	Living Science Ethics - Responsible Conduct of Research	1
PH.260.820	Thesis Research Molecular Microbiology and Immunology (Variable credits)	1 - 22

PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

**Credits** 4-25

### Second Term

PH.260.625	Scientific Grant Writing	2
PH.260.820	Thesis Research Molecular Microbiology and Immunology (Variable credits)	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

**Credits** 5-26

### Third Term

PH.260.820	Thesis Research Molecular Microbiology and Immunology (Variable credits)	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

Select one of the following:<sup>1</sup> 4-8

PH.140.615	Statistics for Laboratory Scientists I (Recommended)	
PH.140.611 & PH.140.612	Statistical Reasoning in Public Health I and Statistical Reasoning in Public Health II	
PH.140.621 & PH.140.622	Statistical Methods in Public Health I and Statistical Methods in Public Health II	

**Credits** 7-32

### Fourth Term

PH.260.820	Thesis Research Molecular Microbiology and Immunology (Variable credits)	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

**Credits** 3-24

**Total Credits** 19-107

<sup>1</sup> All BSPH doctoral degree candidates are required to take coursework in biostatistics. The required biostatistics course is 140.611 Statistical Reasoning in Public Health 1. (140.612, Statistical Reasoning in Public Health 2 is recommended, yet not required). Other recommended statistics coursework includes PH.140.615/616 Statistics for Laboratory Scientists I and II; PH.260.705 Fundamentals of Quantitative Reasoning; PH.140.638 Analysis of Biological Sequences; PH.140.688 Statistics for Genomics; ; 140.621/622 Statistical Methods in Public Health 1 & 2.

Second year and beyond, PhD students should continue to register for a minimum of 16 credits per term, including courses (if any),

- 1 credit for PH.260.821 Research Forum in Molecular Microbiology and Immunology,
- 1 credit for PH.260.822 Seminars in Research in Molecular Microbiology and Immunology, and

- PH.260.820 Thesis Research Molecular Microbiology and Immunology.

PhD students must also register for summer term:

Code	Title	Credits
PH.260.829	Summer Thesis Research	12

**Total Credits** 12

## Additional Course Requirements

PhD students must complete the online course Academic and Research Ethics (550.860.82) in the first term they are enrolled. Additionally, PhD students must take Living Science Ethics – Responsible Conduct of Research (550.600, 1st term) or Research Ethics and Integrity (306.665, 3rd term.) These courses are usually taken during the second year and must be taken prior to taking the Preliminary Oral Exam (POE.)

\*\*All doctoral degree candidates are required to take coursework in biostatistics. The recommended biostatistics course is 140.615 Statistics for Laboratory Scientists I. Other courses that fulfill the requirement include: PH 140.638 Analysis of Biological Sequences (3 credits), Ph 140.688 Statistics for Genomics (3 credits) 140.611/612 Statistical Reasoning in Public Health 1 & 2 and 140.621/622 Statistical Methods in Public Health 1 & 2.

## R3 Course Offerings – Online (.81) and blended (.60) R3 courses by Term

Code	Title	Credits
<i>First Term</i>		
PH.260.700	How Do We Know? - Theory, History, and Practice of Science	3
PH.260.704	Critical Dissection of the Scientific Literature: Taking the Scalpel to Journal Articles	3
PH.260.707	Evidence-Based Teaching in the Biomedical and Health Sciences: Foundations	3
PH.260.713	R3 Writing Seminar for Graduate Students	1
PH.260.720	Communications Primer for the Public Health Sciences	1
<i>Second Term</i>		
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice	3
PH.260.708	Evidence-Based Teaching in the Biomedical and Health Sciences – Practice	3
PH.260.710	Communication Practice for Health Science Professionals	3
PH.260.713	R3 Writing Seminar for Graduate Students	1
PH.260.715	Unleash Your Writing Superpower: Crafting Clear, Concise and Persuasive Prose	3
PH.260.720	Communications Primer for the Public Health Sciences	1
PH.260.844	Causation	3
<i>Third Term</i>		
PH.260.700	How Do We Know? - Theory, History, and Practice of Science	3
PH.260.704	Critical Dissection of the Scientific Literature: Taking the Scalpel to Journal Articles	3
PH.260.705	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences	3

PH.260.713	R3 Writing Seminar for Graduate Students	1
PH.260.720	Communications Primer for the Public Health Sciences	1
<i>Fourth Term</i>		
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice	3
PH.260.705	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences	3
PH.260.710	Communication Practice for Health Science Professionals	3
PH.260.713	R3 Writing Seminar for Graduate Students	1
PH.260.812	The Performance of Leadership: Foundations	2
PH.260.844	Causation	3
PH.260.848	Community-Based Practice Through Civic Engagement	2

## Distribution Requirement

The School requires PhD students to complete a minimum of 18 credits in formal courses outside their own department with no fewer than nine (9) of these credits taken in the Bloomberg School of Public Health. All 18 credits must be taken for a grade (Pass/Fail is not acceptable). Credits earned for Molecular Biology and Genomics and Cell Structure and Dynamics count toward the required credits outside of MMI, as do credits earned for biostatistics. Credits for Academic and Research Ethics, Responsible Conduct of Research and Cells to Society are counted as separate School requirements and are not included in the 18-credit requirement.

## Academic Performance and Academic Probation

Doctoral students are required to maintain a 3.0 grade point average and, as noted above, complete required courses with a grade of B or better. Students who do not comply with these and other academic requirements may be placed on Academic Probation by the Graduate Program Committee. Formal notification of Academic Probation generally will be accompanied by conditions that the student must fulfill in order to be returned to good academic standing. Students who fail to meet those conditions may be dismissed from the program.

## Winter and Summer Institute Courses

Tuition for these courses is charged separately by the School of Public Health Registrar and is not covered by tuition paid during the academic year. Students wishing to take any of these courses may do so at their own expense.

## Certificate Programs

There are several certificate programs offered by the School in specific areas of public health that have fewer course requirements than formal degree programs. Certificate programs are focused academic training programs designed to appeal to students seeking targeted education in a specific area of public health. Educational objectives, admission requirements, courses of study, and other information are provided for each certificate program and can be found at <https://publichealth.jhu.edu/academics/academic-programs/certificate-programs> (<https://publichealth.jhu.edu/academics/academic-programs/certificate-programs/>).

### R3 Certificate

[This certificate is required for all MMI doctoral students within their first 2-3 years, who want to be considered for an F31 fellowship \(https://researchtraining.nih.gov/programs/fellowships/F31\) under the MMI](https://researchtraining.nih.gov/programs/fellowships/F31)

[training grant or for the Katharine E. Welsh Scholarship award of the MMI R3IM PhD Track.](#)

Offered by the MMI-based R3 Center for Innovation in Science Education (R<sup>3</sup>ISE), the R3 Certificate is unique to JHU and aims to help students develop outstanding scientific thinking, analysis, ethical decision-making, as well as professional skills for being role models in a wide range of science-based careers. R3 stands for Rigor, Reproducibility, and Responsibility, which are the cornerstones of good scientific inquiry. The R3 Certificate's required and elective courses center around the philosophical underpinnings of how science works, from bench research to public health. Suggested R3 courses counting towards this Certificate are indicated in the sample curriculum list above, as well as the R3IM PhD track curriculum (see page 16). The full R3 certificate completion requirements can be found here: <https://e-catalogue.jhu.edu/public-health/certificates/rigorreproducibilityandresponsibilityinscientificpractice/#newitemtext>.

### Tropical Medicine Certificate

This certificate program is designed to provide training in tropical medicine and related public health issues through a multidisciplinary approach. It is also designed to prepare participants for working with current and emerging health problems in developing countries and health problems of travelers. This program focuses broadly on issues of tropical health and on clinical tropical medicine. Toward the program's conclusion, students will have acquired a strong scientific basis for preventing, diagnosing, treating, and controlling tropical health problems. The full Tropical Medicine Certificate completion requirements can be found here: <https://e-catalogue.jhu.edu/public-health/certificates/tropical-medicine/>.

## Teaching Assistant

Teaching Assistant positions provide students with an opportunity to develop their teaching and interpersonal skills, to work professionally with faculty and fellow students, and to contribute service to the Department.

**Policy:** All PhD students are required to serve as TA for one course, preferably during the second year of the program. Only MMI courses may be used to fulfill this requirement.

**TA Training:** Students are required to complete the TA training during their first year in the program. The TA training course is offered twice per year—July-December and January-June. The academic program administrator will verify the student has completed the training prior to starting a TA position.

**Compensation:** A student will become eligible for TA compensation after they have satisfied the TA requirement. Completion of the requirement will be noted on the IDP/TAC form and eligibility for compensation will be noted on the departmental TA request form.

### Additional Opportunities:

Gordis Teaching Fellowship  
Teaching Academy- Preparing Future Faculty Program

## R<sup>3</sup>IM Track - Required Courses

All MMI required courses must be passed with a grade of A or B. Students not meeting that standard must repeat the relevant course(s) and pass with an A or a B. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the

GPC Chair. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School's Committee on Academic Standards.

First year students must register for 16-22 credits each term. Students in their 2<sup>nd</sup> year and beyond should register for a maximum of 16 credits.

First year students should register for 260.851 Laboratory Rotation in terms 2, 3, and 4. (See Laboratory Rotations table).

Please note: The R3 Certificate is included in the curriculum below, i.e., MMI doctoral students completing the R<sup>3</sup>IM PhD track are automatically granted the R3 Certificate.

Course	Title	Credits
<b>First Year</b>		
<b>Summer Term</b>		
Introduction to Online Learning: <a href="https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90">https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90</a> ( <a href="https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90/">https://courseplus.jhu.edu/core/index.cfm/go/course.home/cid/90/</a> ) (non-credit)		
	<b>Credits</b>	<b>0</b>
<b>First Term</b>		
PH.550.860	Academic & Research Ethics at BSPH	
PH.260.600	Introduction to the Biomedical Sciences	4
PH.260.700	How Do We Know? - Theory, History, and Practice of Science	3
PH.260.611	Principles of Immunology I	4
PH.260.801	Topics in Immunology I	1
PH.260.607	Methods in life sciences, literature and practice	2
PH.552.6XX	Cells-to-Society (p. 4)	Varies
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
Choose at least 1 of the courses below:		
PH.260.623	Fundamental Virology <sup>1</sup>	
PH.120.602	Concepts of Molecular Biology	
PH.260.636	Evolution of Infectious Disease	
PH.260.707	Evidence-Based Teaching in the Biomedical and Health Sciences: Foundations	
PH.260.713	R3 Writing Seminar for Graduate Students	
	<b>Credits</b>	<b>16</b>
<b>Second Term</b>		
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice <sup>2</sup>	3
PH.260.612	Principles of Immunology II	3
PH.260.802	Topics in Immunology II	1
PH.260.710	Communication Practice for Health Science Professionals <sup>3</sup>	3
PH.260.607	Methods in life sciences, literature and practice	2
PH.260.851	Laboratory Rotations	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	Varies

PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
Choose at least 1 of the courses listed below:		
PH.260.635	Biology of Parasitism	
ME.260.709	Molecular Biology and Genomics (Molecular Biology and Genomics)	
PH.260.710	Communication Practice for Health Science Professionals	
PH.260.844	Causation <sup>4</sup>	
PH.260.715	Unleash Your Writing Superpower: Crafting Clear, Concise and Persuasive Prose <sup>5</sup>	
PH.260.713	R3 Writing Seminar for Graduate Students	
PH.260.709	Evidence-Based Mentoring	3
PH.187.632	Molecular Toxicology	
PH.140.638	Analysis of Biological Sequences	
PH.223.662	Vaccine Development and Application	
	<b>Credits</b>	<b>21-25</b>
<b>Third Term</b>		
PH.260.705	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences (Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences)	3
PH.260.607	Methods in life sciences, literature and practice	2
PH.260.851	Laboratory Rotations	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1
Choose at least 2 of the courses listed below:		
PH.260.627	Pathogenesis of Bacterial Infections	
PH.260.650	Vector Biology and Vector-Borne Diseases	
PH.260.656	Malariaology	
ME.110.728	Cell Structure and Dynamics (Cell Structure and Dynamics)	
PH.140.615	Statistics for Laboratory Scientists I	
PH.260.704	Critical Dissection of the Scientific Literature: Taking the Scalpel to Journal Articles	
PH.260.713	R3 Writing Seminar for Graduate Students	
PH.221.700	Public Engagement Practices for Scientists (Peps) in International Settings	
PH.306.665	Research Ethics and integrity	
	<b>Credits</b>	<b>11-15</b>
<b>Fourth Term</b>		
PH.260.844	Causation <sup>4</sup>	3
PH.260.851	Laboratory Rotations	4 - 8
PH.552.6XX	Cells-to-Society (p. 4)	
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

Choose at least 1 of the courses listed below:

PH.260.658	Advanced Malariology
PH.260.710	Communication Practice for Health Science Professionals
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice
PH.140.616	Statistics for Laboratory Scientists II
PH.260.713	R3 Writing Seminar for Graduate Students
PH.340.618	Epidemiology: the Basics
PH.120.627	Stem Cells and the Biology of Aging and Disease
PH.140.688	Statistics For Genomics
PH.260.848	Community-Based Practice Through Civic Engagement
PH.187.625	Animals in Research: Law, Policy, and Humane Sciences
PH.260.812	The Performance of Leadership: Foundations
PH.223.687	Vaccine Policy Issues
<b>Credits</b>	<b>9-13</b>
<b>Total Credits</b>	<b>57-69</b>

1) First year students must take **at least three out of the following four microbiology** courses: PH.260.623 Fundamental Virology; PH.260.635 Biology of Parasitism; PH.260.627 Pathogenesis of Bacterial Infections; PH.260.650. Vector Biology and Vector Borne Diseases. If of interest, students have the option to take any of the microbiology courses that could not be taken in AY 1 as an AY 2 elective.

2) MMI PhD students are required to take two molecular and cell biology courses taught at the School of Medicine – Molecular Biology & Genomics (ME 260.709); Cell Structure & Dynamics (ME 110.728)

3) The required course 260.701 Anatomy of Scientific Error is suggested for AY 1 yet can be taken in AY2.

4) The required course 260.710 Communications Practice for Health Science Professionals can be taken in AY 1,2 or 3.

5) The required 260.844 Causation course is suggested for Term 4 of AY1 or during year 2.

6) The required course 260.715 Unleash your Writing Superpower can be taken during AY 1, 2, or 3.

7) All BSPH doctoral degree candidates are required to take coursework in biostatistics. The required biostatistics course is 140.611 Statistical Reasoning in Public Health 1. (140.612, Statistical Reasoning in Public Health 2 is recommended, yet not required). Other recommended statistics coursework includes PH.140.615/616 Statistics for Laboratory Scientists I and II; PH.260.705 Fundamentals of Quantitative Reasoning; PH.140.638 Analysis of Biological Sequences; PH.140.688 Statistics for Genomics; 140.621/622 Statistical Methods in Public Health 1 & 2.

## Cells-to-Society Requirements for All Degree Programs

The Council on Education for Public Health (CEPH) requires didactic coursework covering and assessing 12 CEPH-defined Introductory Public

Health Knowledge Learning Objectives. It is important to emphasize that this is a School-level requirement of all degree programs.

The School's Committee on Academic Standards approved 12 online, 0.5 credit, mini-courses, graded S/U (satisfactory/unsatisfactory) that will cover each of the 12 Learning Objectives (see table below). Each of the mini-courses consists of 3-5, 30-40 minute presentations with an accompanying assessment. **Note:** Certain learning objectives can be fulfilled by taking an MMI course that covers this material instead of the mini-course. See notes in the table below.

Each of the C2S mini-courses will be offered 2-4 times during the academic year. The current schedule can be found at: <https://publichealth.jhu.edu/academics/course-directory/schedule-of-cells-to-society-course-offerings> (<https://publichealth.jhu.edu/academics/course-directory/schedule-of-cells-to-society-course-offerings/>).

Please note that for the presentation of these mini-courses, each term has been split into an A section covering the first 4 weeks of the term and a B section that covers the second 4 weeks of the term.

**These 12 mini-courses must be completed by the end of the first academic year.**

Code	Title	Credits
PH.552.601	Foundational Principles of Public Health (or take 260.700.81 in term 1 or 260.700.60 in term 3)	0.5
PH.552.602	The Role of Quantitative Methods in Public Health (or take any of the following courses: 140.611-12 (term 1 and 2) or 140.615-16 (term 3 and 4) or 260.705 (term 3 or term 4))	0.5
PH.552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health (or take 260.700 (term 1 or term 3))	0.5
PH.552.604	Causes and Trends in Morbidity and Mortality ( or take 260.600 (summer, credit in term 1) or 260.844 (term 2 or term 4))	0.5
PH.552.605	The Science of Primary Secondary and Tertiary Prevention in Population Health	0.5
PH.552.606	The Critical Importance of Evidence in Advancing Public Health Knowledge (or take 260.700 (term 1 or term 3))	0.5
PH.552.607	Essentials of Environmental Health	0.5
PH.552.608	Biologic, Genetic and Infectious Bases of Human Disease (or take 260.600 in summer (credit in term 1))	0.5
PH.552.609	Psychological and Behavioral Factors That Affect A Population's Health	0.5
PH.552.610	The Social Determinants of Health (or take 260.844 (term 2 or term 4))	0.5
PH.552.611	Globalization and Population Health	0.5
PH.552.612	Essentials of One Health	0.5
<b>Total Credits</b>		<b>6</b>

Course	Title	Credits
<b>Second Year</b>		
<b>First Term</b>		
PH.550.600	Living Science Ethics - Responsible Conduct of Research	1



PH.260.820	Thesis Research Molecular Microbiology and Immunology	Variable
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

Choose from the list below if requirements have not been met in AY1:

PH.140.611	Statistical Reasoning in Public Health I	
PH.260.707	Evidence-Based Teaching in the Biomedical and Health Sciences: Foundations	

<b>Credits</b>	<b>3</b>
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#### Second Term

PH.260.625	Scientific Grant Writing <sup>6</sup>	2
PH.260.820	Thesis Research Molecular Microbiology and Immunology	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

Choose from the list below if requirements have not been met in AY1:

PH.140.612	Statistical Reasoning in Public Health II	
PH.260.708	Evidence-Based Teaching in the Biomedical and Health Sciences – Practice	

<b>Credits</b>	<b>5-26</b>
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#### Third Term

PH.260.820	Thesis Research Molecular Microbiology and Immunology	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

<b>Credits</b>	<b>3-24</b>
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#### Fourth Term

PH.260.820	Thesis Research Molecular Microbiology and Immunology	1 - 22
PH.260.821	Research Forum in Molecular Microbiology and Immunology	1
PH.260.822	Seminars in Research in Molecular Microbiology and Immunology	1

<b>Credits</b>	<b>3-24</b>
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<b>Total Credits</b>	<b>14-77</b>
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Second year and beyond, PhD students should continue to register for a minimum of 16 credits per term, including courses (if any), 1 credit for Research Forum (260.821), 1 credit for Seminars in Research (260.822), and Thesis Research (260.820). PhD students must also register for summer term: 12 credits Summer Thesis Research (260.829).

### R3 certificate requirement for support on the Molecular and Cellular Basis of Infectious Diseases (MCBID) T32 training grant

The MCBID T32 training grant typically has slots open each year to support MMI PhD students. PhD students who are working in the laboratory of a training grant preceptor can apply for up to two years of training grant support.

To receive support, students must commit to completing the R3 certificate program as described in the link below: <https://e-catalogue.jhu.edu/public-health/certificates/rigorreproducibilityandresponsibilityinscientificpractice/#newitemtext>. (<https://e-catalogue.jhu.edu/public-health/certificates/rigorreproducibilityandresponsibilityinscientificpractice/#newitemtext>) The R3 certificate will be considered a PhD degree requirement for students who are supported by the MCBID T32.

## Written & Oral Exams

### DEPARTMENTAL COMPREHENSIVE EXAMINATION (PhD COMPS)

The School requires a departmentally-administered written comprehensive examination for students in doctoral degree programs. In MMI, the comprehensive examination is intended to test the student's grasp of basic factual material necessary for PhD-level research in molecular microbiology and immunology and their ability to integrate the information obtained in the several disciplines of departmental interest. The examination also assesses each student's ability to identify important scientific problems and formulate hypotheses and plausible experimental approaches to testing those hypotheses.

The MMI comprehensive exam is given at the end of the first year and has a written and an oral component. The written component of the exam takes the form of a critical review of the literature on a currently active topic relevant to first-year coursework. The review should be limited in scope, but be a thorough, scholarly exploration of the topic area. Included should be a discussion of the public health and scientific significance of the topic, a critical analysis of the current state of knowledge in the field including important unanswered questions, a discussion of potential experimental approaches to address those questions, and their implications for future research. The student's written review will be evaluated by a Comprehensive Exam Committee (CEC) of three MMI faculty, with the student's Academic Adviser serving as CEC Chair, and will be defended in an oral examination administered by the same CEC.

This is an examination. Thus, the written review must be the student's own work. However, students must select the review topic in consultation with the Academic Adviser and will receive their CEC's comments on their outline/description (see below). Additionally, students are encouraged to discuss their original ideas, concepts, experimental approaches, etc. with advisers, faculty, and colleagues at whatever length. Members of the CEC will not evaluate the written review before submission. The GPC suggests that students hold at least three substantive meetings with their adviser(s): prior to topic selection, before finalization of the outline/description, and during the preparation of the review/exam document.

### Summary of the Comprehensive Examination Process

- Select a topic relevant to first-year coursework in consultation and with the approval of the student's academic adviser.
- Submit an email stating the topic, cc'd to the academic adviser, to the Student Coordinator.
- The GPC will appoint a CEC of three MMI faculty members. The student's Academic Adviser serves as the Chair of the CEC.
- The student submits an outline or brief description of the topic (about 1 page) to their CEC and their Student Coordinator. The CEC will comment on the proposed content and organization of the review. If necessary, the adviser will assist in revision of the outline.

- Provide copies of the finished review (4000-5000 words, double-spaced, 11 pt font) to each CEC member and to the Student Coordinator. The CEC will grade the review.
- Arrange an oral exam—students are responsible for setting the date and time, subject to CEC member availability.
- Present a 15-minute overview of the written exam document and answer general knowledge questions asked by the CEC. CEC members will grade the oral exam.

## MMI PhD Comprehensive Examination Timetable

Steps	Dates	Who is Responsible?
Letter stating topic due to Student Coordinator	4/1/2024	Student
Review Committee appointed	4/8/2024	GPC
Outline/description due	4/15/2024	Student
Committee response to student	4/29/2024	Adviser/Committee
Final review due	6/10/2024	Student
Grades/request for revision due from committee members	6/17/2024	Committee members
Oral examinations completed	7/19/2024	Student/Committee

### Written Component

The written review will be graded Pass/Conditional Pass/Fail in its entirety on criteria that includes:

- Significance to the field
- Quality of the literature review, including inclusion of primary literature, depth and synthesis of the review, and inclusion of recent literature
- Quality of critical analysis of the state of the field
- Clarity and precision of writing
- Quality of assessment of future research directions

CEC members will grade the review, meet to discuss the critiques, and determine the outcome, and the Chair, on behalf of the CEC, will inform the student of a Pass, Conditional Pass, or Fail. A Conditional Pass constitutes minor revisions that the CEC has decided would help the student improve the quality of the written document, but that does not preclude progression to the oral component.

A Fail requires a substantial revision to the document before the student can proceed to the oral component. The CEC will document the areas that need revision and, in consultation with the student, set a timeline for providing the revised document to the CEC for assessment. The revised document will be due at least two weeks prior to the rescheduled oral examination date. If the revised document does not receive a unanimous grade of Pass from the CEC, this will constitute a second failure of the written portion of the Comprehensive Examination and will trigger a meeting of the GPC to consider the student's dismissal from the PhD program.

### Oral Component

The oral exam will consist of a brief (10-15 minute) oral summary of the review topic, followed by questions from the committee. Students are strongly encouraged to use PowerPoint, Keynote, or similar software in presenting their summary. During the exam, questions will address topics

both related to and outside the immediate subject area of the proposal to assess the student's breadth of understanding of material presented in required coursework, departmental seminars, and research forum. The oral exam will be one to two hours long. The student is responsible for reserving a room for the exam (the Student Coordinator can assist if needed).

### Scoring of Oral Component

After the oral exam, the committee will meet in private to determine an outcome. Possible outcomes are Pass, Conditional Pass, or Fail. The committee will impose specific conditions upon students who receive a Conditional Pass and will specify a timetable and mechanism for satisfying the condition. The outcome of the oral component will be reported to the Student Coordinator by the adviser by email.

A student who passed the written component on their first try, but fails the oral defense must repeat the oral defense within a time frame specified by the committee. The student should meet with each committee member to discuss the areas that need improvement before scheduling a second oral exam.

The following framework should be used in evaluating the oral defense:

- 20% of emphasis: Summary.
- 30% of emphasis: Discussion of questions posed by the committee specific to the review, including
  - Explanation of why this topic was selected from subject matter
  - Demonstration of knowledge of concepts and terms used
  - Demonstration of understanding of experimental evidence discussed
- 50% of emphasis: Discussion of questions extending beyond immediate subject areas to other fields in microbiology and immunology. (Remember, this is a Comprehensive Exam.)

A student who passed the written component on their first try, but fails the oral defense must repeat the oral defense within a time frame specified by the committee. The student should meet with each committee member to discuss the areas that need improvement before scheduling a second oral exam.

The outcome of the comprehensive exam. Each student has two attempts to pass their comprehensive exam. A failure on either the written or the oral component constitutes failure of the comprehensive exam. A total of two determinations of 'fail', on either the written, the oral, or a combination of the components, constitutes failure of the exam and may result in dismissal from the PhD program. For example, a student who passes the written component after two tries but then fails the oral defense may be dismissed from the PhD program.

### Preliminary Oral Examination

**Note:** PH.550.600 Living Science Ethics - Responsible Conduct of Research and the 552.6XX Cells-to-Society series must be completed before taking the POE.

The purpose of the preliminary oral examination (POE), an exam required by the University for all PhD candidates, is to determine whether the student has the depth and breadth of scientific and technical knowledge to undertake dissertation research. Examiners will be concerned with the student's reasoning ability; depth and breadth of knowledge; and ability to develop and conduct research leading to a completed thesis or dissertation. The POE is conducted by a committee of examiners usually selected by the student's adviser according to eligibility rules set by the university (link below). Note that the student's adviser, or co-adviser of

record, is NOT a member of the POE committee. Diversity and inclusion are encouraged on the POE, and any student who would like to include a faculty member from outside of the University, including faculty members from groups underrepresented in the biomedical sciences, on the POE voting committee, may do so by having their adviser seek appointment of the outside faculty member to a Senior Associate position at the BSPH. Appointment as a Senior Associate must be requested in a letter by the Department Chair in a nomination letter to the Dean, for vote by the School's Advisory Board. A copy of the external faculty member's CV (in BSPH CV format) must be included.

**The POE must be scheduled by February 1 and completed by April 30 in the student's second year.** The student is responsible for arranging a room for the exam.

The PPM describing the preliminary oral exam process: [https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/PolicyProcedureMemoranda/Academic\\_Programs\\_03\\_Doctor\\_Of\\_Philosophy\\_Degree\\_071717.pdf](https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/PolicyProcedureMemoranda/Academic_Programs_03_Doctor_Of_Philosophy_Degree_071717.pdf).

The preliminary oral examination form can be found here: <https://my.jhsph.edu/Offices/StudentAffairs/RecordsRegistration/DoctoralCandidateInfo/Pages/default.aspx>.

**Please note that the POE form must be submitted to the School of Public Health Registrar's Office at least one month prior to the exam.**

At least two weeks prior to the scheduled date of the exam, the student should make their Grant Writing Course proposal available to the committee members. This is for background purposes and the proposal will not be evaluated as part of the exam by committee members nor will the examination be confined to topics related to the proposal.

### Conduct of the Exam

The student's adviser does not participate in the student's POE. However, in the student's absence, the adviser will provide a brief overview of the student's research progress to the committee prior to the start of the POE.

The student may prepare a short talk (5 min) based on their proposal and/or their anticipated research project to serve as an introduction to the examination. If a presentation is made, students are strongly encouraged to make use of PowerPoint, Keynote, or similar presentation software.

Exams last 1 to 2 hours. After the exam, a form indicating the outcome (Pass, Conditional Pass, or Fail) will be filled out by the examiners and returned to the School of Public Health Registrar. It is suggested that the POE Committee Chair inform the student's PI of issues that arose in the course of the exam. In particular, if the outcome of the exam is a Conditional Pass or Failure, the advisor will require this information to assist the student in correcting deficiencies.

Requirement for a Conditional Pass includes demonstration of a limited deficiency in a specific area. Examples of acceptable requirements that can be used to fulfill a Conditional Pass include:

1. Reading assigned literature in the area of deficiency and taking an oral examination on the subject material; and
2. Reading assigned literature in the area of deficiency and writing a review paper to be read by one or more POE committee members.

The requirement for a Fail includes demonstration of a significant deficiency in two or more areas. Receipt of a Fail requires retaking the POE. A student who receives a Fail on a POE will be granted one

additional try to pass the POE. Two Fails on the POE will result in termination from the PhD program.

After the completion of the preliminary oral exam, PhD students will be required to complete a "Thesis Documentation Form." Melissa Cooke in the Dean's Office collects these forms. Final orals paperwork will not be processed unless this form is on file with the Dean's Office.

### MMI F31 Proposal Requirement

Success in obtaining independent funding for research is an essential element of most scientific careers. Therefore, as part of their training, each MMI PhD student is required to submit a grant proposal for funding from outside agencies. It is anticipated that most proposals will be for NIH F31 grants, but similar applications to NSF or other governmental or non-governmental organizations will also fulfill the requirement.

The grant application must be submitted by the end of the summer term (late August) in the student's second year, for example, on the F31 NIH submission deadlines of April 8<sup>th</sup> or August 8<sup>th</sup>.

Proposals will generally be written on the student's thesis project (or anticipated thesis project) and should be prepared in close cooperation with the student's PI. Additionally, each student must obtain written critiques of a draft of the proposal from two different MMI faculty members apart from the PI prior to submission. Since students will have formed Thesis Advisory Committees (TACs) by that time, it is suggested that members of the TAC be identified as reviewers. Proposal drafts should be submitted to these reviewers at least ONE MONTH before the application is due at the School's Office or Research Administration (ORA) or to the sponsoring organization. Note that for many applications (for example, NIH applications), the ORA deadline is several days before the sponsor's due date.

Students must notify the Student Coordinator of grant application submissions by completing a form available from the MMI portal. TACs will record submissions on the TAC report form: <https://my.jhsph.edu/sites/MMI/academic-forms/default.aspx>.

### Publication Requirement

Publication is an essential component of training for a research career and a strong publication record as a graduate student is of great benefit to the trainee, the laboratory, and the program. Therefore, each PhD student in MMI is required to have published or submitted for publication in a peer-reviewed journal one or more first-author manuscripts prior to the date of the Final Oral Examination. Publication plans should be discussed as part of the IDP portion of each TAC meeting, and the TAC must indicate on the TAC Report Form whether the student is making satisfactory progress toward publication. If not, the TAC must provide a written recommendation for steps to be followed to expedite publication. Students must notify the Student Coordinator of first author publications by completing the First Author Form available from the MMI departmental portal: <https://my.jhsph.edu/sites/MMI/academic-forms/default.aspx>. Submission of the First Author Form is required before the student's paperwork can be submitted to schedule their final defense.

### Final Oral Exam

The PhD thesis/dissertation is the culminating product of a student's PhD studies and provides a permanent record of a student's intellectual contribution to the field. Unlike published papers that might result from the same work, the thesis both requires and provides the opportunity for the student to creatively place their work in the broadest possible context, explore implications, and speculate on where the future of the

field lies. The preparation of a thesis requires the greatest care both in thought and execution.

Most students find that writing a dissertation requires much more time and effort than expected. For that reason, students are encouraged to write as they go, rather than wait for the final few weeks of their graduate careers. Students are also encouraged to work closely with their advisers on thesis organization, scope, and content. To facilitate these recommendations, the Department requires a student to submit a draft of each of the components of the thesis to their adviser at least eight weeks prior to the Final Oral Examination (thesis defense) date and to submit a final draft of the complete thesis to the readers at least four weeks prior to that date. Readers will provide comments on the thesis at or before the Final Oral Examination and may require that changes be made prior to approval.

The Committee of Thesis Readers conducts the Final Oral Examination and ultimately must approve the thesis. Diversity and inclusion are encouraged for the Final Oral Exam and any student who would like to include a faculty member from outside of the University, including faculty members from groups underrepresented in the biomedical sciences, on the Final Oral Exam voting committee, may do so by having their adviser seek appointment of the outside faculty member to a Senior Associate position at the BSPH. Appointment as a Senior Associate must be requested in a letter by the Department Chair in a nomination letter to the Dean for vote by the School's Advisory Board. A copy of the external faculty member's CV (in BSPH CV format) must be included.

School-wide policies and deadlines governing the selection of readers, conduction of the oral examination, and approval of the written thesis are available from the School of Public Health Registrar's office and online: [https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/PolicyProcedureMemoranda/Academic\\_Programs\\_03\\_Doctor\\_Of\\_Philosophy\\_Degree\\_071717.pdf](https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/PolicyProcedureMemoranda/Academic_Programs_03_Doctor_Of_Philosophy_Degree_071717.pdf).

**Note: The Appointment of Thesis Readers and Final Orals Form must be submitted to the School of Public Health Registrar's Office for processing at least one month prior to the scheduled exam.**

Comprehensive information for doctoral students including timelines, guidelines, exam and graduation information for doctoral students, including Thesis Reader Appointment forms can be found here: <https://my.jhsph.edu/Offices/StudentAffairs/RecordsRegistration/DoctoralCandidateInfo/Pages/default.aspx>

Details of the required format of a PhD thesis are available at: <https://www.library.jhu.edu/library-services/electronic-theses-dissertations/>.

For dissertations that contain published work, suitably modified versions of the published manuscripts may be used as chapters, with careful attribution of the work of co-authors. In general, because the depth of the introductions and discussions of published papers are not sufficient for thesis use, additional introductory and summary chapters will be required in the thesis.

Essay/thesis writing/editing assistance is offered at both campuses:

- JHMI: Editing Referral Service: [http://www.hopkinsmedicine.org/fac\\_development/researchers/publishing.html#ERS](http://www.hopkinsmedicine.org/fac_development/researchers/publishing.html#ERS)
- JHU: Writing Center: <http://krieger.jhu.edu/writingcenter/about/>

Other resources: <https://publichealth.jhu.edu/offices-and-services/office-of-student-affairs/> (<https://publichealth.jhu.edu/offices-and-services/office-of-student-affairs/>)

Official PhD thesis submission to the University is now done electronically. Please review the checklist for specific requirements regarding thesis submission: <https://my.jhsph.edu/Offices/StudentAffairs/RecordsRegistration/DoctoralCandidateInfo/Documents/AFTER%20THE%20FINAL%20DEFENSE%20-%20Revised%20March%202019.pdf>.

The department requires one printed copy of the PhD thesis, which will be kept in the Department Library. Students should provide the Student Coordinator with a PDF, and they will have a copy printed for the department.

## Final Seminar Presentation

At the conclusion of their dissertation research, students are required to present their work at a formal seminar that is advertised throughout the University and open to the public. This seminar is scheduled in conjunction with the Final Oral Examination.

## Time Limits

PhD students must successfully complete all program-specific requirements (such as a dissertation, as detailed in the specific program PPMs) within 7 years. Extensions are possible and must be formally approved by the Committee on Academic Standards.

## Program Policies

For a full list of program policies, please visit the PhD in MMI page where students can find our handbook.

## Vacation/Holiday Policy

Graduate student holiday and vacation schedules traditionally have been flexible to accommodate the varied demands of individual research projects. Guidelines that reflect the Department's expectations are outlined below. These guidelines are not intended to eliminate flexibility in the scheduling of holidays and vacations and do not replace any conditions that might be imposed by fellowships/funding agencies. These guidelines also do not restrict legitimate academic or research activities conducted off-campus, such as attendance at scientific meetings and fieldwork. Students are generally entitled to the following holidays and vacation time:

- University holidays
- Spring break
- The period between last day of 2nd term and the first day of winter intersession
- A fortnight vacation in the second and subsequent years as scheduled by arrangement with the adviser.

Graduate students are expected to be present during winter intersession and summer term or as required by their experimental protocols.

## Leave of absence

A leave of absence (LOA) is for students who are forced to take a temporary break from their programs of study due to reasons beyond their control, such as illness, military service, financial exigency, or pressing personal reasons justifying an interruption of their graduate studies. A leave of absence is an officially recognized inactive student status that is entered on a student's academic record. LOA cannot be used by a student working on a thesis who has completed all other degree requirements. LOA is limited to one academic year except for military service. Application for LOA must be made on a form available

from Student Coordinator. Please discuss any potential LOA with your mentor and the Student Coordinator. Please review the BSPH Schoolwide Policy (<https://e-catalogue.jhu.edu/public-health/policies/academic/academic-leave-absence/>).

## Parental leave

Graduate students may request parental leave following the adoption or birth of a child. Parental leave applies to either or both parents and includes sixty calendar days of stipend/salary support and health insurance coverage. Parental leave must be requested on a Departmental Paid Leave of Absence form, available from the MMI administration. More detailed information is available here (<https://www.jhu.edu/assets/uploads/2017/06/newchildaccommgradandpostdoc.pdf>).

## Sick Leave

All students receiving a fellowship/stipend from BSPH for full-time study while enrolled in a Master's or PhD program at the School are entitled to 15 days (three weeks) of paid sick leave per year. Days may be used for a student's own sickness or to care for a family member. Unused days may not be carried over into the following 12-month period and are not payable upon departure. When a student takes sick leave, they should notify their faculty adviser and keep them as up-to-date as feasible. At its discretion, the department or adviser may require the student to submit verification of the need for sick leave from their healthcare provider to the University Health Service Center for review. Any documents containing a student's medical information must be kept separate from their academic file. Extended absences (more than two weeks) must be reported by the student and the adviser to the Department Administrator as quickly as possible. If the illness requires an extended absence, the student may apply for a leave of absence.

## Policy for MMI PhD Students Changing Thesis Laboratories

MMI PhD students occasionally want to or have to, change thesis laboratories. In all cases, PhD students must choose to do their thesis research in the laboratory of a faculty member with a primary appointment in MMI, or in the laboratory of a faculty member with a joint appointment in MMI who is also designated as a trainer on an MMI training grant. Students can request a list of current training faculty who are eligible to accept PhD students from the academic coordinator or the Graduate Program Committee (GPC) chair at any time. To remain in good standing, students should adhere to the following process:

PhD students considering changing thesis laboratories must first schedule a confidential meeting with the departmental ombud to discuss the proposed change. Based on the discussion, the ombud may direct the student to additional resources such as the BSPH Office of Student Life or the university ombuds office.

The student may then consult with faculty members to identify a new thesis laboratory and thesis project. At some point during this process, the student must notify their current adviser of the proposed change with a copy of this correspondence also sent to the graduate student coordinator, the department administrator, and the chair of the GPC. The student must work with their current adviser in a professional manner to transfer any relevant notes, data, reagents, or supplies.

The student and proposed new thesis adviser must then submit the Thesis Adviser Form to the graduate student coordinator for approval by the departmental administrator. In addition to serving as a commitment to advise the student, this form also details the available financial

support. Once this form has been approved, the student will be free to pursue thesis research in the new laboratory.

## Learning Outcomes

According to the requirements of the Council on Education for Public Health (CEPH), all BSPH degree students must be grounded in foundational public health knowledge. Please view the list of specific CEPH requirements by degree type (<https://e-catalogue.jhu.edu/public-health/ceph-requirements/>).

The MMI Department offers two doctoral programs with the following learning outcomes:

Students in the traditional MMI PhD program will:

- Demonstrate knowledge of the principles of immunology (molecular and cellular interactions that govern innate and adaptive immunity), applied to the conduct of laboratory research in areas of biology relevant to public health.
- Demonstrate fundamental and advanced knowledge in the genetics, immuno- and molecular biology, and biochemistry of infectious diseases of public health importance.
- Demonstrate a foundational and applied understanding of the epistemological evidence base and logical reasoning underlying the rigorous, reproducible, and responsible scientific processes in biomedicine and public health.
- Be able to explain the theory and applied principles of conducting research ethically and responsibly.
- Use conceptual and practice-applicable skills in biostatistics to analyze, interpret and critically evaluate study designs and methods to address basic science and public health problems.
- Be able to design and conduct rigorous experiments independently to generate new knowledge of molecular mechanisms and host-pathogen interactions in infectious diseases.

Students in the MMI PhD program concentration on Rigorous, Reproducible, and Responsible Research Investigation in Immunology & Microbiology (R<sup>3</sup>IM) will:

- Demonstrate a foundational and advanced understanding of the philosophical and historical evidence base underlying the rigorous and reproducible scientific processes in biomedicine and public health.
- Judge the data quality and methodological appropriateness of research used to support cause-effect relationships and evidence-based decision-making across the biomedical and public health disciplines.
- Use conceptual and practice-applicable skills in biostatistics to analyze, interpret and critically evaluate study designs and methods to address basic science and public health problems.
- Explain the theory and applied principles of conducting research ethically and socially responsibly.
- Communicate (orally and in writing) scientific data, methods, and reasoning to the public health and basic science communities, as well as to lay audiences.
- Acquire fundamental and advanced knowledge in the genetics, molecular biology, and biochemistry of the human immune system, as well as host-pathogen interactions in the course of infectious diseases of public health importance.

- Design and conduct rigorous experiments to acquire new knowledge of molecular mechanisms and host-pathogen interactions in infectious diseases.

The Department's Graduate Program Committee (GPC) and faculty constantly monitor the components of the MMI graduate program for its effectiveness. Adjustments are made when necessary to maintain an optimal balance of didactic, literature-based, and technical training.

## Professional Development

In addition to the commitment to enhancing their scientific knowledge base, critical thinking, and research skills, MMI is equally dedicated to students' development as science professionals. Experience teaches that students who start the process of formulating and refining a career plan early in their academic career have a better chance of achieving their goals. In this spirit, MMI requires that starting in their first year each student participate in the structured career and professional development OPTIONS program offered by the Johns Hopkins Professional Development and Career Office (PDCO). This multi-year program is designed to help students identify career objectives and systematically devise and implement a strategic plan to achieve their goals. This plan includes a series of programs - **Career Exploration**, **Career Development**, and **Career Readiness** – that provide opportunities to explore career options, train in and develop valuable professional skill sets, and even gain hands-on experience as an intern in their field of interest. In addition, PDCO holds **Career Clinics** to aid students in preparing winning resumes, CVs, and web pages to prepare them to enter the marketplace. See the PDCO website for details of the program: <https://pdco.med.jhmi.edu/>. The progress and direction developed through the PDCO program will be monitored at each Thesis Advisory Committee meeting and documented in each student's customized Individual Development Plan (IDP).

In addition to the program offered by the PDCO, MMI has academic offerings designed to assist students with professional development such as the required course Scientific Grant Writing (260.625) and the elective Business of Academic Biomedical Research (260.815).

## Johns Hopkins Teaching Academy

The Teaching Academy serves as an exceptional graduate and post-doctoral fellow professional development program. The Teaching Academy offers PhD students and post-doctoral fellows college-level teacher training and academic career preparation opportunities through courses, workshops, teaching practicums, teaching as research fellowship appointments, and individual consultation. The Teaching Academy is located in the Center for Educational Resources (CER) in the Garrett Room of the Milton S. Eisenhower Library on the Homewood campus. How to find us: <https://cer.jhu.edu/teaching-academy> (<https://cer.jhu.edu/teaching-academy/>).

NOTE: Teaching or outside work: Federal law stipulates a maximum of 19 hours for paid work outside of laboratory thesis work. All paid fellowships, part-time working opportunities, and teaching need to be discussed with the student's primary adviser.

## Career Resources

The Career Services Office at the Bloomberg School helps students, alumni, faculty, staff, and employers navigate the world of public health jobs. Career Services Office provides valuable resources to assist students in the process. Specifically, the Bloomberg School's Career Services Office provides career coaching, resume preparation, a database of jobs and internships, and networking opportunities.