STUDENT HANDBOOK

for the

Biomedical Sciences Graduate Program

Penn State College of Medicine

August 13, 2014
# TABLE OF CONTENTS

I. Introduction ................................................................. 4
   A. Objective of the BMS Graduate Program .............................. 4
   B. Degree Programs .......................................................... 4
   C. Responsibilities of the Student, Dissertation Adviser, and Committee ............................................................... 4

II. Laboratory Rotations and Selection of Dissertation Adviser (Section V. outlines these procedures for M.D/Ph.D. candidates.) ................................................................. 5
   A. Selecting Laboratory Rotations .......................................... 5
   B. Rotation Reports and Presentation ..................................... 5
   C. Choosing a Dissertation Adviser ....................................... 6
   D. Student Responsibilities in Choosing Advisers ........................ 6

III. Requirements for the Doctor of Philosophy (Ph.D.) Degree ...................... 6
   A. Curriculum ..................................................................... 7
      1. Choice of Curricular Track ........................................... 7
      2. Registration ................................................................. 7
      3. Coursework and Scholarship and Research Integrity .......... 7
      4. Curricular Requirements ............................................. 8
      5. Seminar and Journal Club Presentations and Attendance ... 10
   B. Candidacy Examination .................................................. 10
      1. Purpose of the Candidacy Examination ........................... 10
      2. When Does a Student Take the Candidacy Examination? .... 10
      3. Who Administers the Candidacy Examination? ................ 10
      4. Format of the Candidacy Examination ............................ 10
      5. Grading of the Candidacy Examination ............................ 11
      6. Approval of the Candidacy Examination Results ............... 11
      7. What Happens if a Student Fails the Candidacy Examination? ........................................................................ 11
   C. Doctoral Committee ....................................................... 11
      1. Members ..................................................................... 11
      2. Responsibilities of the Doctoral Committee ....................... 12
   D. English Competency ...................................................... 12
   E. Comprehensive Examination ........................................... 13
      1. Purpose of the Comprehensive Examination .................... 13
      2. When Does a Student Take the Comprehensive Examination? ........................................................................ 13
      3. Who Administers the Comprehensive Examination? ......... 13
      4. Format of the Comprehensive Examination ....................... 13
      5. Who Grades the Comprehensive Examination? ................ 13
      6. What are the Requirements of the Student After Completion of the Comprehensive Examination? ........................................................................ 13
   F. Dissertation Research .................................................... 14
   G. Dissertation Preparation and Final Oral Examination ............... 14
   H. Time Limitation ............................................................. 14

IV. Requirements for the Master of Science (M.S.) Degree .......................... 18
   A. Curriculum ..................................................................... 18
      1. Choice of Curricular Track ........................................... 18
      2. Registration ................................................................. 18
      3. Coursework and Scholarship and Research Integrity .......... 18
V. Ph.D. Requirements for the M.D./Ph.D.-Joint Degree ................................................................. 25
   A. Laboratory Rotations and Selection of Dissertation Adviser .................................................. 25
   B. Curriculum ............................................................................................................................... 25
      1. Choice of Curricular Track .................................................................................................. 25
      2. Registration ....................................................................................................................... 25
      3. Coursework and Scholarship and Research Integrity......................................................... 26
      4. Curricular Requirements .................................................................................................... 26
      5. Seminar and Journal Club Presentations and Attendance .............................................. 29
   C. Candidacy Examination .......................................................................................................... 29
      1. The USMLE Step 1 Replaces the Candidacy Examination for M.D./Ph.D. Students .......... 29
      2. Approval of the Candidacy Examination Results ............................................................. 29
      3. What Happens if a Student Fails the USMLE Step 1? ....................................................... 29
   D. Doctoral Committee ................................................................................................................ 29
      1. Members ............................................................................................................................. 29
      2. Responsibilities of the Doctoral Committee ....................................................................... 30
   E. English Competency ................................................................................................................ 30
   F. Comprehensive Examination .................................................................................................. 31
      1. Purpose of the Comprehensive Examination ..................................................................... 31
      2. When Does a Student Take the Comprehensive Examination? ........................................ 31
      3. Who Administers the Comprehensive Examination? ........................................................ 31
      4. Format of the Comprehensive Examination ...................................................................... 31
      5. Who Grades the Comprehensive Examination? ................................................................ 31
      6. What are the Requirements of the Student after Completion of the Comprehensive
         Examination? ....................................................................................................................... 31
   G. Dissertation Research ............................................................................................................. 32
   H. Dissertation Preparation and Final Oral Examination .......................................................... 32
   I. Time Limitation ....................................................................................................................... 32

VI. Concurrent or Dual-Title Degree Programs ........................................................................ 37

VII. General Information ............................................................................................................ 37

VIII. BMS Faculty Members .................................................................................................... 37

IX. BMS Advisory Committee ................................................................................................... 38

X. Appendix: ............................................................................................................................. 38
   A. Graduate Student Progress – Annual Review Form ............................................................. 39
I. Introduction

Welcome to the Biomedical Sciences (BMS) Graduate Program with Options in Biochemistry and Molecular Genetics (BMG), Translational Therapeutics (TT), and Virology and Immunology (VIRIM) at the Penn State College of Medicine. The integrated nature of the Program and Options permits students to choose their dissertation adviser and committee members from the approximately 150 faculty members of the Program who represent more than 20 basic science and clinical departments. Research interests of Program faculty members are wide-ranging in both scientific disciplines and specific research interests. Graduate students benefit from the opportunity to tailor both their coursework and research to align closely with their particular interests.

This Student Handbook has been compiled as an aid and resource for graduate students and faculty in the Program. It contains current information and degree requirements for the Program. Additional University requirements can be found in The Pennsylvania State University Bulletin of Graduate Degree Programs (www.psu.edu/bulletins/whitebook) and the Thesis Guide (available at http://www.gradsch.psu.edu/current/thesis.html).

A. Objective of the BMS Graduate Program

The objective of the BMS Graduate Program is to train individuals for advanced professional careers in the biomedical sciences and related fields. The Program is directed toward students who plan to pursue the Doctor of Philosophy (Ph.D.) degree. Successful completion of the Program implies that the student has (1) achieved a satisfactory knowledge in biomedical sciences and related areas; (2) demonstrated accomplishment in research; (3) consistently demonstrated high standards of scholarship and academic integrity; (4) demonstrated the ability to read and critically evaluate scientific literature; and (5) demonstrated effective scientific communication in written and oral presentations. Upon successful completion of the degree program, the individual should have the competence to engage in independent research and education in the biomedical sciences or related fields.

B. Degree Programs

The BMS Graduate Program and its Options confer the Ph.D. degree and, in special situations, the Master of Science (M.S.) degree. However, students are generally not admitted to the Program to pursue the M.S. degree. The objective for students enrolled in the Ph.D. degree program is to demonstrate excellence in research, scholarship, and scientific experimentation in biomedical sciences. The M.S. degree is strongly research oriented and is designed to develop research competence.

C. Responsibilities of the Student, Dissertation Adviser, and Committee

Each student is responsible for ensuring that the Graduate School and BMS Graduate Program requirements for his/her degree program are met at appropriate times. Because of the time and effort required to fulfill the degree requirements of the BMS Graduate Program, students must
have permission from their dissertation adviser and other individuals designated by the Graduate School to seek concurrent employment (http://www.gradsch.psu.edu/current/assistantships.html) or undertake additional educational programs (see Section VI. Concurrent Degree Programs of this handbook and http://www.gradsch.psu.edu/policies/faculty/concurrent.html).

Students, dissertation advisers, and committees are responsible to fulfill appropriate deadlines for meetings and examinations required by the Graduate School and the BMS Graduate Program. Specific functions for the Ph.D. committee are described in sections III. C.

On an annual basis, the BMS support staff will provide the ‘Graduate Student Progress – Annual Review Form’ (form in Appendix A) to the student and dissertation adviser to be reviewed, updated, signed, and returned to the BMS Program Office.

II. Laboratory Rotations and Selection of Dissertation Adviser

(Section V. outlines these procedures for M.D./Ph.D. candidates.)

A. Selecting Laboratory Rotations

A key decision during the first year is selecting a dissertation adviser and the laboratory in which to conduct dissertation research. The BMS Graduate Program Advisory Committee provides advice and oversight during this process. A number of opportunities during the first year provide information to assist in making this choice.

1. Research interest presentations occur during orientation. As a follow-up to these presentations, appointments should be scheduled to talk in more detail with faculty about research areas of particular interest.

2. Laboratory rotations during the first year provide an opportunity to spend time with faculty members of particular interest to learn more about their research program and laboratory environment. These rotations also provide opportunities to design and conduct experiments, collect and analyze data, and present results in written and oral reports. These are all critical skills required for success in a scientific career. Students do at least three rotations in different laboratories that are approximately 8 weeks in length to sample the breadth of research opportunities. The times for doing the rotations are arranged by the student in consultation with the Program Chair and the faculty with whom they rotate. Rotations can be done in the Fall, Spring, and/or Summer semesters.

B. Rotation Reports and Presentation

A written report is required for two of the rotations. Many students choose not to write a report for the last rotation of the Spring semester to provide more time to prepare for the candidacy examination. This report on the research conducted during the rotation is written solely by the student and submitted to the rotation adviser and the Chair of the BMS Graduate Program within one week after completion of each rotation. The reports are evaluated by the rotation adviser and another member of the BMS Graduate Faculty.

Each student also gives an oral presentation on one of his/her rotations during the Spring semester. Presentations are approximately 15 minutes in length and provide the background,
approach(es), outcome(s), and discussion of the results for the chosen research rotation. The oral presentation is evaluated by members of the BMS Graduate Program Advisory Committee.

Further details about the rotation reports and presentation are provided in the description of the BMS 596 course.

The written and oral reports provide an opportunity to evaluate (1) the progress of each student in understanding experimental design, conducting experiments, and critically analyzing results and (2) the written and oral presentation skills of each student. In part, these reports also assess whether the English Competence requirement of the Graduate School has been fulfilled. Other mechanisms for evaluating English Competence are provided by the various oral presentations and written answers to essay questions that students provide during their graduate study. Proficiency in English must be demonstrated prior to administration of the comprehensive examination.

C. Choosing a Dissertation Adviser

Selection of a dissertation adviser is based on a) student interest in the research program, b) consent of the faculty member, and c) available funding to support the student in the lab of interest, which includes written approval from the intended adviser’s departmental Chair. Typically, this decision is finalized after completion of the candidacy examination.

A student who at any time becomes concerned that his/her choice of dissertation adviser may not have been appropriate, needs to discuss the situation with the Director of their Program or Option and their dissertation adviser as soon as possible. If the student ultimately decides s/he would like to try to identify a new dissertation adviser, the student will provide at least four-weeks written notice to his/her Director and current dissertation adviser. During this time, the student must identify a new adviser willing to accept him/her into the laboratory and assume financial responsibility for the student (see above) at the end of his/her time in the current laboratory. The current dissertation adviser retains all laboratory notebooks, reagents (antibodies, cell lines, etc.), experimental protocols, and other research materials.

D. Student Responsibilities in Choosing Advisers

Identification of advisers for rotations and the final choice of a dissertation adviser and committee members are the responsibility of the student. Failure to choose a dissertation adviser by the end of the Fall semester of the student’s second year can be considered lack of academic progress. Failure to develop an extended professional relationship with a dissertation adviser that permits development of the scholarship and rigor necessary to obtain a Ph.D. in the biomedical sciences can be considered unsatisfactory scholarship. Lack of academic progress or unsatisfactory scholarship could result in termination from the graduate degree program.

III. Requirements for the Doctor of Philosophy (Ph.D.) Degree

To earn the Ph.D. degree in BMS, a student must: (A) complete the appropriate curricular track maintaining at least a 3.00 grade-point average (GPA) as defined below (4. Curricular
Requirements) for the Ph.D. degree in the BMS Graduate Program; (B) pass the candidacy examination typically at the end of Year 1; (C) constitute his/her doctoral committee; (D) demonstrate high-level competence in the use of the English language in reading, writing, and speaking prior to scheduling the comprehensive examination; (E) pass the comprehensive examination typically prior to the beginning of year three; (F) conduct dissertation research; and (G) prepare a dissertation and successfully defend it in the final oral examination.

At the end of this section, a checklist is provided for following progress toward the degree.

A. Curriculum

1. Choice of Curricular Track

By the end of the first year, each student chooses among four curricular tracks that focus coursework on different disciplines. Generally, the choices of the curricular track and the dissertation adviser are finalized at the same time. The four tracks are the Biomedical Sciences (BMS) track, the Biochemistry and Molecular Genetics (BMG) track, the Translational Therapeutics (TT) track, and the Virology and Immunology (VIRIM) track. These tracks align with the BMS Program and the three Options in the Program, respectively.

2. Registration

Each student is responsible for proper registration each semester via eLion. Prior to completion of the comprehensive examination, a student must be registered for at least 9 credits each semester (excluding the summer semester) to maintain full-time student status. In situations where the total number of credits derived from formal coursework does not equal 9, additional required credits are secured by registering for an appropriate number of credits of Individual Studies (BMS 596) prior to passing the candidacy examination or Thesis Research (BMS 600) after passing the candidacy examination but prior to passing the comprehensive examination.

All formal coursework is generally completed prior to the scheduling of the comprehensive examination. After completion of the comprehensive examination, students register for Thesis Preparation (601). A student remains eligible to take courses following successful completion of this examination, although this eligibility may have limitations. Each student should consult with his/her dissertation adviser and/or the appropriate Director for details and limitations.

It is important to note that students with a half-time assistantship may register for no more than 12 credits. Therefore, there may be circumstances where a student may be engaged in laboratory rotations or dissertation research but may not, due to the 12-credit maximum, register for Individual Studies or Thesis Research.

3. Coursework and Scholarship and Research Integrity

Table 1 lists the required courses for the four curricular tracks during the first two years of the program with the typical time for taking each course. Elective courses in the first year are chosen in consultation with the Program Chair or appropriate Director. Electives in the second year are chosen in consultation with the dissertation adviser and/or doctoral committee members.

In 2009, The Graduate School instituted a requirement for training in Scholarship and Research Integrity (SARI), which for BMS students includes two components:
* Completion of the CITI module ‘Responsible Conduct of Research’ (completed independently online prior to June 30th of year one; [https://www.citiprogram.org/default.asp](https://www.citiprogram.org/default.asp))

* Pass the course BMS 591 – Ethics in the Life Sciences

More information can be found at [http://www.pennstatehershey.org/web/gsa/home/integrity](http://www.pennstatehershey.org/web/gsa/home/integrity).

4. Curricular Requirements

The Ph.D. degree in Biomedical Sciences with any appropriate Option is conferred on a student in recognition of excellent attainment of knowledge and productive scholarship in biomedical sciences. In addition to the course requirements provided above, the student must achieve:

- a minimum GPA of 3.00 to advance to candidacy, qualify for the comprehensive examination, and graduate. Grades for Foundations of Biomedical Research (BMS 597A), Colloquium (590), other journal clubs (for example, IBIOS 580, MICRO 572, and PHARM 597) Individual Studies (596), and Thesis Research (600) are not counted in calculating this GPA for the Ph.D. degree from the BMS Graduate Program;

- a minimum of 24 graduate credits of which 14 must be taken at Penn State. These graduate credits include, at most, 2 credits of BMS 596 and do not include credits for BMS 600, 601, 610, and 611. Up to 10 credits of graduate work may be transferred from another institution. For limitations on transfer of credits see ‘Transfer Credit’ at [http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=degreeReq1](http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=degreeReq1). The BMS Advisory Committee must approve the credit transfer request prior to submission of the request to the Office of Graduate Enrollment Services for final approval; and

- at least 18 credits at the 500-600 level.

A student who fails to make acceptable progress in a degree program will be dropped from the program. One or more failing grades or a cumulative GPA below 3.00, calculated based on the BMS Program policy on GPA for the Ph.D. degree described above, for any semester or session or combination of semesters and/or sessions may be considered evidence of failure to maintain satisfactory scholarship. A GPA below 3.00 automatically places a student on academic probation and the student must meet with the Program Chair or the appropriate Director to determine the course of action required to address this situation and avoid dismissal from the Program. A student receiving grades of C or below in both BMS 597C and BMS 597D (Organizing Principles of Biomedical Science I and II) during the first semester may be dismissed from the Program. Except in extreme circumstances, a student will only be permitted to drop one course during the first year because of academic difficulties in the course. The Program Advisory Committee may initiate action as described in Appendix III of the Graduate School Bulletin to terminate a student for unsatisfactory scholarship ([http://bulletins.psu.edu/bulletins/whitebook/appendices.cfm?section=appendix3](http://bulletins.psu.edu/bulletins/whitebook/appendices.cfm?section=appendix3)).
### Table 1: Typical Coursework Schedule for Ph.D. Degree for the Four Curricular Tracks: Years 1 and 2

<table>
<thead>
<tr>
<th>Core Requirements for All Students</th>
<th>BMS PROGRAM TRACK</th>
<th>BMG OPTION TRACK</th>
<th>TT OPTION TRACK</th>
<th>VIRIM OPTION TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
</tr>
<tr>
<td>2 BMS Required Credits</td>
<td>8 BMG Option Required Credits</td>
<td>12 TT Option Required Credits</td>
<td>11 VIRIM Option Required Credits</td>
<td></td>
</tr>
<tr>
<td>11 Elective Credits</td>
<td>5 Elective Credits</td>
<td>1 Elective Credit</td>
<td>2 Elective Credits</td>
<td></td>
</tr>
</tbody>
</table>

#### Fall Year 1 (7 credits)

<table>
<thead>
<tr>
<th>Core Requirement (6)</th>
<th>BMS 597C/D Organizing Principles I &amp; II (6)</th>
<th>BMS 597C/D Organizing Principles I &amp; II (6)</th>
<th>BMS 597C/D Organizing Principles I &amp; II (6)</th>
<th>BMS 597C/D Organizing Principles I &amp; II (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Requirement (1)</td>
<td>BMS 504 Art of Scientific Communication I (1)</td>
<td>BMS 504 Art of Scientific Communication I (1)</td>
<td>BMS 504 Art of Scientific Communication I (1)</td>
<td>BMS 504 Art of Scientific Communication I (1)</td>
</tr>
<tr>
<td>Core Requirement (1)</td>
<td>BMS 505 Art of Scientific Communication II (1)</td>
<td>BMS 505 Art of Scientific Communication II (1)</td>
<td>BMS 505 Art of Scientific Communication II (1)</td>
<td>BMS 505 Art of Scientific Communication II (1)</td>
</tr>
<tr>
<td>Core Requirement (2)</td>
<td>BMS 596 Individual Study: Research (2)</td>
<td>BMS 596 Individual Study: Research (2)</td>
<td>BMS 596 Individual Study: Research (2)</td>
<td>BMS 596 Individual Study: Research (2)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>BCHEM 522 Molecular Genetics: Genes to Genomes (3)</td>
<td>PHARM 520 Principles of Drug Action (2)</td>
<td>MICRO 581 Principles of Immunology A (1)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>BMS 590 Colloquium (1)</td>
<td>BCHEM 590 Colloquium (1)</td>
<td>PHARM 551 Anti-infective Therapeutics (1)</td>
<td>Journal Club (1)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>BCHEM 521 Structure, Function, &amp; Regulation of Biological Molecules (3)</td>
<td>PHARM 552 Integrated Systems Pharm (1)</td>
<td>MICRO 553 Science of Virology (4)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 553 Gastrointestinal &amp; Immunomodulatory Therapeutics (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 554 Anticancer Therapeutics (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 590 Colloquium (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision regarding Program or Option; BMS Graduate Program Candidacy Examination - Enter laboratory for dissertation research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Requirement (1)</td>
<td>BMS 591 Ethics (1)</td>
<td>BMS 591 Ethics (1)</td>
<td>BMS 591 Ethics (1)</td>
<td>BMS 591 Ethics (1)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>BMS 590 Colloquium (1)</td>
<td>BCHEM 590 Colloquium (1)</td>
<td>PHARM 551 Anti-infective Therapeutics (1)</td>
<td>Journal Club (1)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>BCHEM 521 Structure, Function, &amp; Regulation of Biological Molecules (3)</td>
<td>PHARM 552 Integrated Systems Pharm (1)</td>
<td>MICRO 553 Science of Virology (4)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 553 Gastrointestinal &amp; Immunomodulatory Therapeutics (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 554 Anticancer Therapeutics (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 590 Colloquium (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Year 2 (2 to 8 credits)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Requirement (1)</td>
<td>BMS 590 Colloquium (1)</td>
<td>BCHEM 590 Colloquium (1)</td>
<td>PHARM 561 Neuropharmacology (2)</td>
<td>Journal Club (1)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>BCHEM 521 Structure, Function, &amp; Regulation of Biological Molecules (3)</td>
<td>PHARM 562 Endocrine Pharmacology (2)</td>
<td>MICRO 560 Concepts in Immunology (4)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 590 Colloquium (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 561 Neuropharmacology (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Year 2 (2 to 8 credits)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 590 Colloquium (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 562 Endocrine Pharmacology (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option Specific</td>
<td>PHARM 590 Colloquium (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehensive Exam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate credit hours for each course.

1. The minimum number of elective credits required is shown. In consultation with their dissertation adviser, students may take additional credits. Elective credits can include BMS 597A Foundations in Biomedical Research. Elective credits cannot include additional BMS 596 credits or any 600, 601, 610, or 611 credits.

2. At least two of the elective credits must be from BMS 520, BCHEM 522, PHARM 520, MICRO 581/582 and at least two elective credits must be from BMS 581, BCHEM 521, PHARM 551/552/553/554, PHARM 561, PHARM 562, GENET 587.

3. VIRIM students must take either MICRO 553 Science of Virology or MICRO 560 Concepts in Immunology. This choice must be made in consultation with the student’s dissertation adviser.

4. To complete the Journal Club requirement, VIRIM students must register for either IBIOS 580 Critical Readings in Immunology (1) in the Fall semester or MICRO 572 Literature Report (1) Fall and/or Spring.

5. The BMS 590 requirements can be satisfied by another approved colloquium course.
5. Seminar and Journal Club Presentations and Attendance

Students in the Program are expected to attend seminars given in the BMS Student Seminar Series. Beginning in the second year, each student will present a seminar in this series on an annual basis. Students may also be required to give seminars in other series such as the seminar series in the department of their adviser.

Students are also expected to attend presentations given by invited speakers in the BMS Seminar Series. Attendance at other relevant seminars is highly recommended and may be required by the thesis adviser or the department of the adviser. These seminars are excellent opportunities to enhance knowledge of associated fields.

Students are also expected to participate annually in a journal club. Specific departments may require participation in a journal club.

B. Candidacy Examination

1. Purpose of the Candidacy Examination

The candidacy examination serves to assess the student’s mastery of the basic body of knowledge and development of the breadth and depth of scholarship that is expected of Ph.D. candidates. The formal purpose for the examination is to determine whether the student has earned admission to candidacy, and can hence begin a period of research aimed toward a Ph.D. dissertation. This examination provides the Candidacy Examination Committee and the student with a gauge of the capabilities of the student. It can also point out deficiencies that can be corrected by coursework or independent study. Finally, the candidacy serves as another mechanism for evaluating the student’s communication skills.

2. When Does a Student Take the Candidacy Examination?

The University regulation is that a student may take the candidacy examination after completion of 18 credits of graded coursework following the Baccalaureate. The University also requires that the examination be taken within three semesters after admission to the Program (excluding summers). Hence, a student admitted in the Fall of one calendar year must take the examination by the end of the Fall semester of the next calendar year. Typically, the candidacy examination for the BMS Graduate Program is administered after the first year of coursework is completed. All students are required to have a minimum GPA of 3.00 as defined by the Program and to have satisfactorily completed all courses in the Fall core curriculum at the time the candidacy is taken.

3. Who Administers the Candidacy Examination?

The BMS Advisory Committee will choose members of the BMS Graduate Faculty to write questions and administer the oral component of the examination.

4. Format of the Candidacy Examination

The student should be prepared to answer questions related to aspects of the biomedical sciences encountered in their first-year curriculum as well as material students should have acquired from other resources (e.g., undergraduate education, seminars, laboratory rotations). The candidacy examination has a written and an oral component.

The written component will have up to twelve questions and students will have at least three days to answer the questions. The answers will be evaluated in terms of the student’s breadth and
depth of knowledge as well as competence in English. The graded responses to the written portion will be returned to the student prior to the oral component.

The oral portion of the examination will follow within approximately two weeks of the written section. To be eligible to take the oral examination, the student must pass the written examination. The oral portion of the examination provides an opportunity to determine whether or not incorrect responses on the written component indicate serious deficiencies as well as to probe the breadth and depth of scholarship of the student in other areas.

Specific details about the examination will be provided approximately four weeks prior to administration of the examination.

5. Grading of the Candidacy Examination

Graded responses to each written question are averaged to determine the *overall performance* on the written portion.

Following the oral portion of the examination, each member of the committee assigns a grade and these grades are averaged to determine the *overall performance* on the oral portion.

6. Approval of the Candidacy Examination Results

After the student passes the candidacy examination, the Chair of the BMS Graduate Program completes the proper forms and sends them to the Office of Graduate Enrollment Services. The Chair will also provide a written statement attesting to the student's English competence or recommendations for additional studies.

7. What Happens if a Student Fails the Candidacy Examination?

A student who fails either the written or oral portion of the candidacy examination may be given the opportunity to retake that portion at a future date or may be required to withdraw from the Ph.D. program depending on their level of performance on the examination and in other aspects of the Ph.D. program. The decision of whether to permit a second examination and to determine the appropriate time for its administration is at the discretion of the BMS Advisory Committee. If permitted to retake the examination, the student may proceed with laboratory rotations and/or selection of a dissertation adviser and establishment of a doctoral committee. However, the doctoral committee cannot be officially formed until the candidacy examination is successfully completed. A student who fails a second candidacy examination will be required to withdraw from the Ph.D. program.

C. Doctoral Committee

1. Members

The student should confer with his/her dissertation adviser when considering members to suggest for their doctoral committee and the committee must conform to the guidelines of the Graduate School ([http://bulletins.psu.edu/graduate/degreerequirements/degreeReq1](http://bulletins.psu.edu/graduate/degreerequirements/degreeReq1)). This committee consists of four or more active members of the Graduate Faculty. The Advisory Committee recommends that five members be appointed to the doctoral committee, particularly in those situations where two members of the committee are from the same research group. The dissertation adviser must be a member of the doctoral committee and usually serves as chair. At least one member of the committee must be an “Outside Field Member” who must represent a field outside the candidate’s major field of study to provide a broader range of disciplinary perspectives and expertise. This member may be from a different department than the
dissertation adviser or from a Program or Option different than that of the student. In addition, there must be at least one regular member of the committee whose primary appointment is in an administrative unit outside the unit in which the dissertation adviser’s (and co-adviser’s, on committees with a co-adviser) primary appointment is held. Additionally, this “Outside Unit Member” should have no budgetary connection to the dissertation adviser (and co-adviser). Examples of conflicts of interest that would disqualify someone as the Outside Unit Member include serving as co-principal investigator on grants or other funding sources with the dissertation adviser (or co-adviser). The same individual may serve as both the Outside Field and Outside Unit Member if they fulfill the appropriate criteria.

The dissertation adviser submits the suggested names of members for the doctoral committee to the BMS Advisory Committee. All doctoral committees must be approved by the BMS Advisory Committee and reviewed periodically to ensure its members continue to qualify for service in their designated roles.

The doctoral committee should meet at least once a year. Required paperwork from this meeting (see Appendix A Graduate Student Progress – Annual Review Form) must be filed with the BMS Program Office.

2. Responsibilities of the Doctoral Committee

The doctoral committee is responsible for approving the broad outline of the student’s program and should review the program as soon as possible after the student’s admission to candidacy. Continuing communication among the student, the dissertation adviser, and members of the committee is strongly recommended to preclude misunderstandings and to develop a collegial relation between the candidate and the committee members.

D. English Competency

All Ph.D. candidates are required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking. The Graduate School requires the Program to formally attest to a student's English competency before the comprehensive examination can be scheduled.

All students are evaluated for their English competency as part of their written and oral rotation reports, candidacy examination, colloquium, and other components of the degree program. If the student does not demonstrate acceptable competence based on the above evaluations, the student's adviser will be responsible for providing mechanisms for improving these skills. Examples include: 1) verbal critiques of assigned professional papers, 2) presentations in laboratory meetings, 3) additional presentations in colloquium, and/or 4) successful completion of specific courses designated by the Advisory Committee and targeted toward written and/or spoken English as appropriate. If remediation is required, the doctoral committee will re-evaluate the student following completion of the required studies and the student's adviser will notify the Program Chair in writing when the student has met the English competency requirement.
E. Comprehensive Examination

1. Purpose of the Comprehensive Examination

Successful completion of the comprehensive examination indicates that the student has a broad and in-depth background in biomedical sciences. It marks the watershed from taking courses to being a full-time researcher. The examination serves to allow the committee to thoroughly examine the student's preparation for dissertation research.

2. When Does a Student Take the Comprehensive Examination?

To schedule and take the comprehensive examination, a student must be registered full- or part-time, and must have a GPA of 3.00 as defined by the Program. Generally, the comprehensive examination is taken when a student has finished essentially all coursework and is ready to focus on research work for the dissertation. Typically, students take the examination some time after the second year; however, it is strongly encouraged not to delay beyond the third year. At the request of the appropriate Program or Option Director, the Associate Dean of the Graduate School officially schedules the examination. The date, time, and place must be agreed upon by the student and all members of the doctoral committee. Once the date, time, and place are determined, and at least three weeks prior to the date, the student must notify the BMS Program Office to schedule the examination through the Office of Graduate Enrollment Services.

3. Who Administers the Comprehensive Examination?

The student's doctoral committee administers the comprehensive examination.

4. Format of the Comprehensive Examination

The examination includes both writing and orally defending a research grant proposal. Specific requirements for the comprehensive examination vary among the curricular tracks. Students should consult the Director of their curricular track for specific guidelines related to the required format.

5. Who Grades the Comprehensive Examination?

The comprehensive examination is not given a letter grade. Two-thirds of the doctoral committee must agree that the student has passed the examination. If a failure occurs, it is the discretion of the committee to permit a second examination and to determine the approximate time for administration of the second examination. The comprehensive examination will only be given twice. A second failure will result in the withdrawal from Ph.D. candidacy. This information is relayed to the BMS Program Office, which notifies the Office of Graduate Enrollment Services for official entry into the student's record.

6. What are the Requirements of the Student After Completion of the Comprehensive Examination?

The student must keep the doctoral committee informed of his/her progress on an annual basis. The dissertation adviser should be consulted in planning regular meetings of the committee. At the discretion of the committee, the student may be required to submit an annual written progress report. Meeting dates of the committee are recorded on the ‘Graduate Student Progress – Annual Review Form’.
F. Dissertation Research

Critical components of Ph.D. training are gaining the abilities to select a worthy research problem, to organize an approach for problem solving, to design and execute meaningful experiments, to interpret results cogently in light of the work of others, and to produce a scholarly exposition in written form. The candidate will assemble an independent body of work during their dissertation research that demonstrates they have gained these abilities.

It is expected that students will have at least one first-author manuscript submitted or published based on their dissertation research prior to the final oral examination.

G. Dissertation Preparation and Final Oral Examination

Both the dissertation adviser and the student are responsible for ensuring the completion of the written dissertation and for adequate consultation with members of the doctoral committee. A formal meeting of the doctoral committee with the student to discuss the written dissertation is required prior to scheduling the final oral examination. The written dissertation should be in its final form, with appropriate notes, bibliography, tables, etc., exhibiting polished content and style, and be reviewed and approved by the adviser for distribution to committee members at least two weeks prior to the scheduled meeting.

Normally, no less than three months must elapse between the comprehensive examination and final oral examination. Additionally, the graduate program must be completed within six years of passing the comprehensive examination or a second comprehensive examination is required.

After the doctoral candidate has satisfied all other requirements for the degree and upon recommendation of the dissertation adviser and the committee that the written dissertation is acceptable, the Program Chair will submit a request to the Office of Graduate Enrollment Services to schedule the final oral examination. Major revisions to the written dissertation should be completed before scheduling the oral examination and this revised document should be distributed to committee members at least two weeks prior to the final oral examination.

The final oral examination should be a public seminar followed by an oral dissertation defense. The following points may be used as guidelines for evaluation:

- Is the research original?
- Are proper experimental designs, appropriate techniques, and interpretation of results described in the dissertation?
- Is the candidate able to defend the methods, findings, and conclusions of the research?
- Is the candidate sufficiently knowledgeable of the literature to place his or her contribution in proper context?
- Is the dissertation research worthy of publication?

The decision of the committee will be reported to the Program Chair and to the Graduate School on the forms provided by the Graduate School.

H. Time Limitation

A doctoral student is required to complete the program, including acceptance of the doctoral thesis, within eight years from the date of successful completion of the candidacy examination.
Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.
Ph.D. Degree Check List

1. Admitted to Graduate School: __________ (date)

2. Candidacy examination: (within three semesters after enrollment in the Ph.D. program)

3. Selection of dissertation adviser (after end of Spring semester of first year)

4. Recommend members for doctoral committee: (in consultation with dissertation adviser; typically by the end of the Fall semester of the second year)
   
i. Official appointment of Ph.D. doctoral committee by the Dean of the Graduate School following recommendation by BMS Advisory Committee

5. Committee meetings must be scheduled at least once a year and the committee-meeting-report form must be filed with the BMS Program Office within two weeks after the committee meeting.

6. Coursework (variable depending on curricular track and student interests; only core required courses are listed; students should consult Table 1 of this Handbook, their first-year adviser, and http://www.pennstatehershey.org/web/gsa/home/studentresources/current/courses, for required and elective courses for the curricular track(s) of interest)

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>BMS 597C</td>
<td>Organizing Prin I</td>
<td>3</td>
<td>BMS 505</td>
<td>Sci Comm II</td>
<td>1</td>
</tr>
<tr>
<td>BMS 597D</td>
<td>Organizing Prin II</td>
<td>3</td>
<td>BMS 596</td>
<td>Indiv Studies</td>
<td>2</td>
</tr>
<tr>
<td>BMS 504</td>
<td>Sci Comm I</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>BMS 591</td>
<td>Ethics</td>
<td>1</td>
<td>BMS 600</td>
<td>Thesis Research</td>
<td>0-9</td>
</tr>
<tr>
<td>BMS 600</td>
<td>Thesis Research</td>
<td>0-8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Complete communication requirements (prior to comprehensive examination).
8. Comprehensive examination (typically prior to the beginning of the third year; at least 3 months prior to final oral examination) arranged through Program Chair and Dean of the Graduate School.

9. In consultation with dissertation adviser and doctoral committee, determine when dissertation research is nearing completion and you can begin to concentrate on writing your dissertation.


11. Activate intent to graduate on eLion during the semester of intended graduation; see Thesis, Dissertation and Performance Calendar [http://www.gradsch.psu.edu/current/thesis.html](http://www.gradsch.psu.edu/current/thesis.html); deadline is typically within the first two weeks of the semester.

12. By the appropriate deadline date [http://www.gradsch.psu.edu/current/thesis.html](http://www.gradsch.psu.edu/current/thesis.html) submit a draft of the dissertation to the Thesis Office for format review

13. Draft of dissertation submitted to dissertation adviser (at least 4 weeks before anticipated submission to all members of doctoral committee)

14. Copies of the draft dissertation including the abstract consistent with the ProQuest/UMI Agreement (limit 350 words) and vitae (one page maximum) in approved Graduate School form to all members of doctoral committee

15. Reviewed draft dissertation returned to graduate student for correction (within 2 weeks after received)

16. Receive approval from doctoral committee to schedule final oral examination after major corrections are made

17. Schedule final oral examination through BMS Program Office (at least 3 weeks in advance). The final oral examination must be scheduled on a date no later than the published Graduate School deadline for graduation in that semester [http://www.gradsch.psu.edu/calendar/](http://www.gradsch.psu.edu/calendar/)

18. Public seminar and final oral examination

19. Final revisions to thesis in response to comments from doctoral committee

20. Obtain signatures of dissertation adviser and doctoral committee members on Approval Page

21. Review and approval of dissertation by Program Chair (allow 1 week for review)

22. Submit final dissertation to the eTD Website [http://www.etd.psu.edu/](http://www.etd.psu.edu/) by the deadline date

23. Submit signed doctoral approval page, ProQuest/UMI Agreement, Survey of Earned Doctorates, and fee (payable at [http://www.gradsch.psu.edu/current/thesis.html](http://www.gradsch.psu.edu/current/thesis.html)) to the Office of Theses and Dissertations

24. Acceptance of dissertation by The Graduate School

*NOTE: The student is responsible for meeting all time schedule requirements for their degree.*
IV. Requirements for the Master of Science (M.S.) Degree

To earn a M.S. degree in BMS, a student must: (A) complete the appropriate curricular track maintaining at least a 3.00 GPA as defined for the M.S. degree in this handbook; (B) constitute his/her master’s committee; (C) demonstrate high-level competence in the use of the English language in reading, writing, and speaking; (D) conduct thesis research; and (E) prepare a thesis or submit a manuscript as a first author to a peer-reviewed journal. This manuscript must be approved by the thesis adviser and be based on the student’s thesis research conducted in the BMS Graduate Program.

At the end of this section, a checklist is provided for following progress toward the degree.

A. Curriculum

1. Choice of Curricular Track

By the end of the first year, each student chooses among four curricular tracks that focus coursework on different disciplines. These four tracks are the Biomedical Sciences (BMS) track, the Biochemistry and Molecular Genetics (BMG) track, the Translational Therapeutics (TT) track, and the Virology and Immunology (VIRIM) track. These tracks align with the BMS Program and the three Options in the Program, respectively.

2. Registration

Each student is responsible for proper registration each semester via eLion. A student must be registered for at least 9 credits each semester (excluding the summer semester) to maintain full-time student status. In situations where the total number of credits derived from formal coursework does not equal 9 and a student needs to be registered full time, additional required credits are secured by registering for an appropriate number of credits of BMS 596 Individual Studies (Year 1), or BMS 600 Thesis Research (Year 2 until graduation). It is important to note that students with a half-time assistantship may register for no more than 12 credits. Therefore, there may be circumstances where a student may be engaged in laboratory rotations or thesis research but may not register for Individual Studies or Thesis Research due to the 12-credit maximum.

3. Coursework and Scholarship and Research Integrity

Table 2 lists the required courses for the four curricular tracks during the program with the typical time for taking each course. Elective courses in the first year are chosen in consultation with the Program Chair or appropriate Director. Electives in the second year are chosen in consultation with the thesis adviser and/or master’s committee.

In 2009, The Graduate School instituted a new requirement for training in Scholarship and Research Integrity (SARI), which for BMS students includes two components:

* Completion of the CITI module ‘Responsible Conduct of Research’ (completed independently online prior to June 30th of year one; [https://www.citiprogram.org/default.asp](https://www.citiprogram.org/default.asp))

* Pass the course BMS 591 – Ethics in the Life Sciences

More information can be found at [http://www.pennstatehershey.org/web/gsa/home/integrity](http://www.pennstatehershey.org/web/gsa/home/integrity).
Table 2: Typical Coursework Schedule for the M.S. Degree for the Four Curricular Tracks

<table>
<thead>
<tr>
<th>Core Requirement for All Students</th>
<th>BMS PROGRAM TRACK</th>
<th>BMG OPTION TRACK</th>
<th>TT OPTION TRACK</th>
<th>VIRIM OPTION TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
</tr>
<tr>
<td>2 BMS Required Credits</td>
<td>8 BMG Option Required Credits</td>
<td>12 TT Option Required Credits</td>
<td>6 BMS 600 Credits</td>
<td>11 VIRIM Option Required Credits</td>
</tr>
<tr>
<td>6 BMS 600 Credits</td>
<td>6 BMS 600 Credits</td>
<td>6 BMS 600 Credits</td>
<td>6 BMS 600 Credits</td>
<td>6 BMS 600 Credits</td>
</tr>
<tr>
<td>11 Elective credits^2</td>
<td>5 Elective Credits^1</td>
<td>1 Elective Credits^1</td>
<td>2 Elective Credits^1</td>
<td>11 Elective credits^2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Fall Year 1                      |                  |                  |                  |                  |
| Core Requirement (6)             | BMS 597C/D Organizing Principles I & II (6) | BMS 597C/D Organizing Principles I & II (6) | BMS 597C/D Organizing Principles I & II (6) | BMS 597C/D Organizing Principles I & II (6) |
| Core Requirement (1)             | BMS 504 Art of Scientific Communication I (1) | BMS 504 Art of Scientific Communication I (1) | BMS 504 Art of Scientific Communication I (1) | BMS 504 Art of Scientific Communication I (1) |
| Spring Year 1                    |                  |                  |                  |                  |
| Core Requirement (1)             | BMS 505 Art of Scientific Communication II (1) | BMS 505 Art of Scientific Communication II (1) | BMS 505 Art of Scientific Communication II (1) | BMS 505 Art of Scientific Communication II (1) |
| Core Requirement (2)             | BMS 596 Individual Study: Research (2) | BMS 596 Individual Study: Research (2) | BMS 596 Individual Study: Research (2) | BMS 596 Individual Study: Research (2) |
| Option Specific                  | Elective(s)^3 | BCHEM 522 Molecular Genetics: Genes to Genomes (3) | PHARM 520 Principles of Drug Action (2) | MICRO 581 Principles of Immunology A (1) |
| Option Specific                  |                  |                   |                  |                  |
| Option Specific                  |                  |                  |                  |                  |

Decision regarding Program or Option; Enter laboratory for thesis research

| Fall Year 2                      |                  |                  |                  |                  |
| Core Requirement (1)             | BMS 591 Ethics (1) | BMS 591 Ethics (1) | BMS 591 Ethics (1) | BMS 591 Ethics (1) |
| Option Specific                  | BMS 590 Colloquium^1 (1) | BCHEM 521 Structure, Function, & Regulation of Biological Molecules (3) | PHARM 551 Anti-infective Therapeutics (1) | MICRO 553 Science of Virology^2 (4) |
| Option Specific                  | BMS 600 Thesis Research (≥3) | BCHEM 590 Colloquium (1) | PHARM 552 Integrated Systems Pharmacology (1) | BMS 600 Thesis Research (≥3) |
| Option Specific                  | Elective(s)^3 | BMS 600 Thesis Research (≥3) | PHARM 553 Gastrointestinal & Immunomodulatory Therapeutics (1) | Journal Club^7 (1) |
| Option Specific                  |                  |                  |                  |                  |
| Option Specific                  |                  |                  |                  |                  |
| Option Specific                  |                  |                  |                  |                  |
| Option Specific                  |                  |                  |                  |                  |
| Option Specific                  |                  |                  |                  |                  |
| Spring Year 2                    |                  |                  |                  |                  |
| Option Specific                  | BMS 590 Colloquium^1 (1) | BCHEM 590 Colloquium (1) | PHARM 561 Neuropharmacology (2) | MICRO 560 Concepts in Immunology^4 (4) |
| Option Specific                  | BMS 600 Thesis Research (≥3) | (PROGRAM ELECTIVE) | PHARM 562 Endocrine Pharmacology (2) | GENET 581 Genetics of Model Organisms A: Bacterial and Viral Pathogenesis (1) |
| Option Specific                  | Elective(s)^3 | BMS 600 Thesis Research (≥3) | PHARM 590 Colloquium (1) | Journal Club^7 (1) |
| Option Specific                  |                  |                  |                  |                  |
| Option Specific                  |                  |                  |                  |                  |

Numbers in parentheses indicate credit hours for each course.

^2The minimum number of elective credits required is shown. In consultation with their thesis adviser, students may take additional credits. Elective credits can include BMS 597A Foundations in Biomedical Research. Elective credits can include up to 2 additional credits of BMS 596 but do not include any additional credits (beyond 6 credits) of BMS 600.

^3At least two of the elective credits must be from BMS 520, BCHEM 522, PHARM 520, MICRO 581/582 and at least two elective credits must be from BMS 581, BCHEM 521, PHARM 551/552/553/554, PHARM 561, PHARM 562, GENET 587.

^4To complete the Journal Club requirement, VIRIM students must register for either IBIOS 580 Critical Readings in Immunology (1) in the Fall semester or MICRO 572 Literature Report (1) Fall and/or Spring.

^5The BMS 590 requirements can be satisfied by another approved colloquium course.
4. Curricular Requirements

The Master of Science degree in Biomedical Sciences with any appropriate Option is conferred on a student in recognition of high attainments and productive scholarship in biomedical sciences. In addition to the course requirements provided above, the student must achieve:

- a minimum GPA of 3.00. Grades for all courses including Colloquium (590), other journal clubs (for example, IBIOS 580, MICRO 572, and PHARM 597), up to 2 credits of Individual Studies (596), and up to 6 credits of Thesis Research (600) are counted in calculating this GPA for the M.S. degree in the BMS Graduate Program;

- a minimum of 30 graduate credits, of which 20 must be from Penn State, and up to 10 credits of graduate work may be transferred from another institution. For limitations on transfer of credits see ‘Transfer Credit’ at http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=masters#masters Admission. The BMS Advisory Committee must approve the credit transfer request prior to submission of the request to the Office of Graduate Enrollment Services for final approval; and

- at least 18 credits at the 500-600 level of which at least 6 must be BMS 600.

A student who fails to make acceptable progress in a degree program will be dropped from the program. One or more failing grades or a cumulative GPA below 3.00, calculated based on the BMS Program policy on GPA for the M.S. degree described above, for any semester or session or combination of semesters and/or sessions may be considered evidence of failure to maintain satisfactory scholarship. A GPA below 3.00 automatically places a student on academic probation and the student must meet with the Program Chair or the appropriate Director to determine the course of action required to address this situation and avoid dismissal from the Program. A student receiving grades of C or below in both BMS 597C and BMS 597D during the first semester may be dismissed from the Program. The Program Advisory Committee may initiate action as described in Appendix III of the Graduate School Bulletin (http://bulletins.psu.edu/bulletins/whitebook/appendices.cfm?section=appendix3).

5. Thesis Adviser Requirement

The master’s candidate must identify a thesis adviser willing to accept the student into his/her laboratory. Since the BMS Graduate Program does not provide financial support (neither stipend nor tuition) for master’s candidates, the student is responsible for paying tuition and having sufficient resources for living expenses.

6. Seminar and Journal Club Presentations and Attendance

Students in the Program are expected to attend seminars given in the BMS Student Seminar Series. Beginning in the second year, each student will present a seminar in this series on an annual basis. Students may also be required to give seminars in other series such as the seminar series in the department of their adviser.

Students are also expected to attend presentations given by invited speakers in the BMS Seminar Series. Attendance at other relevant seminars is highly recommended and may be required by the thesis adviser or the department of the adviser. These seminars are excellent opportunities to enhance knowledge of associated fields.

Students are also required to participate annually in a journal club.
B. Master’s Committee

1. Members
The student should confer with his/her thesis adviser when considering members to suggest for their master’s committee. This committee consists of three or more active members of the Graduate Faculty. The thesis adviser is a member of the master’s committee, unless she/he declines this responsibility, and usually serves as chair.

The student submits the suggested names of members for the master’s committee to the BMS Advisory Committee. All master’s committees must be approved by the BMS Advisory Committee and reviewed periodically to ensure its members continue to qualify for service in their designated roles. See the BMS Graduate Program’s Graduate Student Master’s Committee Procedures and Committee Appointment Form for additional information.

The master’s committee meets at least twice a year. Required paperwork from this meeting (see Appendix A Graduate Student Progress – Annual Review Form) must be filed with the BMS Program Office.

2. Responsibilities of the Master’s Committee
The master’s committee is responsible for approving the broad outline of the student’s program and should review the program as soon as possible after the student’s admission to the master’s Program. Continuing communication among the student, the thesis adviser, and members of the committee is strongly recommended to preclude misunderstandings and to develop a collegial relation between the candidate and the committee members.

C. English Competency
All M.S. candidates are required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking.

All students are evaluated for their English competency as part of their written and oral rotation reports, Colloquium, and other components of the degree program. If the student does not demonstrate acceptable competence based on the above evaluations, the student's adviser will be responsible for providing mechanisms for improving these skills. Examples include: 1) verbal critiques of assigned professional papers, 2) presentations in laboratory meetings, 3) additional presentations in Colloquium, and/or 4) successful completion of specific courses designated by the Advisory Committee and targeted toward written and/or spoken English as appropriate. If remediation is required, the master's committee will re-evaluate the student following completion of the required studies and the student's adviser will notify the Program Chair in writing when the student has met the English competency requirement.

D. Thesis Research
Critical components of M.S. training are gaining the abilities to select a worthy research problem, to organize an approach for problem solving, to design and execute meaningful experiments, to interpret results cogently in light of the work of others, and to produce a scholarly exposition in written form. The candidate will assemble an independent body of work during their thesis research that demonstrates they have gained these abilities.
E. Thesis Preparation and Approval

Both the thesis adviser and the student are responsible for ensuring the completion of the written thesis and for adequate consultation with members of the master’s committee. The written thesis should be in its final form, with appropriate notes, bibliography, tables, etc., exhibiting polished content and style, and be reviewed and approved by the adviser prior to distribution to committee members. In lieu of a thesis, the master’s candidate may have a submitted manuscript as a first author to a peer-reviewed journal. This manuscript must be approved by the thesis adviser and be based on the student’s thesis research conducted in the BMS Graduate Program.

The following points may be used as guidelines for evaluation of the M.S. thesis or submitted manuscript by the thesis committee:

Is the research original?

Are proper experimental designs, appropriate techniques, and interpretation of results described in the thesis or paper?

Does the thesis or paper demonstrate that the candidate is sufficiently knowledgeable of the literature to place his or her contribution in proper context?

Is the thesis research worthy of publication?

The decision of the committee will be reported to the Program Chair and to the Graduate School on the forms provided by the Graduate School.

F. Time Limitation

All requirements for the M.S. degree (including acceptance of a thesis or paper) must be met within eight years of admission to degree status. Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.
M.S. Degree Check List

1. Admitted to Graduate School: __________ (date)

2. Selection of thesis adviser (immediately following admission to the M.S. program)

3. Recommend members for thesis committee: (in consultation with thesis adviser; completed within one semester of entering the M.S. program)

4. Committee meetings must be scheduled at least twice a year and the committee-meeting-report form must be filed with the BMS Program Office.

5. Coursework (variable depending on curricular track and student interests; only core required courses are listed; students should consult Table 2 of this Handbook, their first-year adviser, and http://www.pennstatehershey.org/web/gsa/home/studentresources/current/courses, for required and elective courses for the curricular track(s) of interest)

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>BMS 597C</td>
<td>Organizing Prin I</td>
<td>3</td>
</tr>
<tr>
<td>BMS 597D</td>
<td>Organizing Prin II</td>
<td>3</td>
</tr>
<tr>
<td>BMS 504</td>
<td>Sci Comm I</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR 2</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>BMS 591</td>
<td>Ethics</td>
<td>1</td>
</tr>
<tr>
<td>BMS 600</td>
<td>Thesis Research</td>
<td>3-8</td>
</tr>
</tbody>
</table>

6. Complete communication requirements.
7. In consultation with thesis adviser and master’s committee, determine when thesis research is nearing completion and you can begin to concentrate on writing your thesis.


9. Activate intent to graduate on eLion during the semester of intended graduation; see Thesis Office Calendar (http://www.gradsch.psu.edu/current/thesis.html); deadline is typically within the first two weeks of the semester.

10. By the semester deadline date (http://www.gradsch.psu.edu/current/thesis.html) submit a draft of the thesis to the Thesis Office for format review

11. Draft of thesis (or published paper) submitted to thesis adviser for approval to distribute to other members of master’s committee

12. Copies of the draft thesis to all members of master’s committee

13. Reviewed draft thesis returned to graduate student for correction (within 2 weeks after received)

14. Copies of revised draft thesis distributed to all committee members

15. Final revisions to thesis in response to comments from members of master’s committee

16. Obtain signatures of thesis adviser and master’s committee members on Approval Page

17. Review and approval of thesis by Program Chair (allow 1 week for review)

18. Submit final thesis to the eTD Website (http://www.etd.psu.edu/) by the deadline date

19. Submit signed master’s approval page and fee (payable at http://www.gradsch.psu.edu/current/thesis.html) to the Office of Theses and Dissertations

20. Acceptance of thesis by The Graduate School

NOTE: The student is responsible for meeting all time schedule requirements for their degree.
V. Ph.D. Requirements for the M.D./Ph.D.-Joint Degree

The National Institutes of Health (NIH) has long recognized the need for dually trained physician-scientists to translate the discoveries of basic science laboratories into effective clinical treatments. Scientists with doctoral level training in both the practice of clinical medicine and research are important practitioners of this critical step in the discovery of new medical treatments. The College of Medicine has had a formal M.D./Ph.D. joint-degree program in support of this goal since 1995.

After completion of the first two years of medical school (M1 and M2), the candidate enters the BMS Graduate Program to pursue the work required for the Ph.D. degree. To earn the Ph.D. portion of this joint degree, a student must: (A) complete the appropriate curricular track maintaining at least a 3.00 grade-point average (GPA) as defined below (4. Curricular Requirements) for the M.D./Ph.D. degree in the BMS Graduate Program; (B) pass the United States Medical Licensing Examination (USMLE) Step 1, which serves as the candidacy examination for candidates for the M.D./Ph.D. degree; (C) constitute his/her doctoral committee; (D) demonstrate high-level competence in the use of the English language in reading, writing, and speaking prior to scheduling the comprehensive examination; (E) pass the comprehensive examination typically prior to the beginning of the second year of graduate school (G2); (F) conduct dissertation research; and (G) prepare a dissertation and defend it in the final oral examination.

At the end of this section, a checklist is provided for following progress toward the degree.

A. Laboratory Rotations and Selection of Dissertation Adviser

At least three laboratory rotations are completed during Years M1 and M2 as detailed by the M.D./Ph.D. Program. Typically, the dissertation adviser is selected during Year M2 and the student enters this research laboratory after passing the USMLE Step 1.

B. Curriculum

1. Choice of Curricular Track

By the end of the first year of graduate work (G1), each student chooses among four curricular tracks that focus coursework on different disciplines. These four tracks are the Biomedical Sciences (BMS) track, the Biochemistry and Molecular Genetics (BMG) track, the Translational Therapeutics (TT) track, and the Virology and Immunology (VIRIM) track. These tracks align with the BMS Program and the three Options in the Program, respectively.

2. Registration

Each student is responsible for proper registration each semester via eLion. Prior to completion of the comprehensive examination, a student must be registered for at least 9 credits each semester (excluding the summer semester) to maintain full-time student status. In situations where the total number of credits derived from formal coursework does not equal 9, additional required credits are secured by registering for an appropriate number of credits of Individual Studies (BMS 596) prior to passing the candidacy examination or Thesis Research (BMS 600).
after passing the candidacy examination but prior to passing the comprehensive examination.

All formal coursework is generally completed prior to the scheduling of the comprehensive examination. After completion of the comprehensive examination, students register for Thesis Preparation (601). A student remains eligible to take courses following successful completion of this examination, although this eligibility may have limitations. Each student should consult with his/her dissertation adviser and/or the appropriate Director for details and limitations.

It is important to note that students with a half-time assistantship may register for no more than 12 credits. Therefore, there may be circumstances where a student may be engaged in laboratory rotations or dissertation research but may not, due to the 12-credit maximum, register for Individual Studies or Thesis Research.

### 3. Coursework and Scholarship and Research Integrity

Table 3 lists the required courses for the four curricular tracks during Years G1 and G2 of the M.D./Ph.D. joint-degree program with the typical time for taking each course. Elective courses in Year G1 are chosen in consultation with the Program Chair, the appropriate Director, and/or the dissertation adviser. Electives in the second year are chosen in consultation with the dissertation adviser and/or doctoral committee.

In 2009, The Graduate School instituted a new requirement for training in Scholarship and Research Integrity (SARI), which for BMS students includes two components:

* Completion of the CITI module ‘Responsible Conduct of Research’ (completed independently online prior to June 30th of year one; [https://www.citiprogram.org/default.asp](https://www.citiprogram.org/default.asp))

* Pass the course BMS 591 – Ethics in the Life Sciences

More information can be found at [http://www.pennstatehershey.org/web/gsa/home/integrity](http://www.pennstatehershey.org/web/gsa/home/integrity).

### 4. Curricular Requirements

The Ph.D. degree in the M.D./Ph.D. joint-degree program in Biomedical Sciences with any appropriate Option is conferred on a student in recognition of excellent attainment and productive scholarship in biomedical sciences. In addition to the course requirements provided above, the student must achieve:

- passed all medical school courses during Years M1 and M2;
- a minimum GPA of 3.00 to qualify for the comprehensive examination and to graduate. Grades for Foundations of Biomedical Research (BMS 597A), Colloquium (590), other journal clubs (for example, IBIOS 580, MICRO 572, and PHARM 597) Individual Studies (596), and Thesis Research (600) are not counted in calculating this GPA for the Ph.D. degree from the BMS Graduate Program; and
- the credit requirements at the 500-600 level indicated in Table 3.

A M.D./Ph.D. student who fails to make acceptable progress in the Ph.D.-degree program will be dropped from the program. One or more failing grades or a cumulative GPA below 3.00, calculated based on the BMS Program policy on GPA described above, for any semester or session or combination of semesters and/or sessions may be considered evidence of failure to maintain satisfactory scholarship. A GPA below 3.00 automatically places a student on academic probation and the student must meet with the Program Chair or the appropriate
Director to determine the course of action required to address this situation and avoid dismissal from the Program. The Program Advisory Committee may initiate action as described in Appendix III of the Graduate School Bulletin (http://bulletins.psu.edu/bulletins/whitebook/appendices.cfm?section=appendix3).
<table>
<thead>
<tr>
<th>COURSES</th>
<th>BMS PROGRAM TRACK</th>
<th>BMG OPTION TRACK</th>
<th>TT OPTION TRACK</th>
<th>VIRIM OPTION TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
<td>11 Core Requirement Credits</td>
</tr>
<tr>
<td></td>
<td>2 Program Required Credits</td>
<td>8 BMG Option Required Credits</td>
<td>4 TT Option Required Credits</td>
<td>7 VIRIM Option Required Credits</td>
</tr>
<tr>
<td></td>
<td>5 MD/PhD Required Credits</td>
<td>5 MD/PhD Required Credits</td>
<td>5 MD/PhD Required Credits</td>
<td>5 MD/PhD Required Credits</td>
</tr>
<tr>
<td></td>
<td>6 Elective Credits</td>
<td>4 Elective Credits</td>
<td>4 Elective Credits</td>
<td>1 Elective Credit</td>
</tr>
<tr>
<td>Core Requirement (8) Medical courses taken in Years M1 and M2</td>
<td>Successful completion of courses taken during Years M1 and M2</td>
<td>Successful completion of courses taken during Years M1 and M2</td>
<td>Successful completion of courses taken during Years M1 and M2</td>
<td>Successful completion of courses taken during Years M1 and M2</td>
</tr>
</tbody>
</table>

### Spring Year M1
- Elective
- Elective
- Elective
- Elective

### Fall Year M2
- Elective
- Elective
- Elective
- Elective

### Spring Year M2
- Elective
- Elective
- Elective
- Elective

### End of M2 Year: USMLE Step 1 (replaces BMS Graduate Program candidacy examination) - Enter laboratory for dissertation research

### Fall Year G1
<table>
<thead>
<tr>
<th>Core Requirement (1)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Requirement (1)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
</tr>
</tbody>
</table>

### Spring Year G1
<table>
<thead>
<tr>
<th>Core Requirement (1)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
<th>Elective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Requirement (1)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
</tr>
<tr>
<td>Option Specific</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
<td>Elective(s)</td>
</tr>
</tbody>
</table>

### Comprehensive Examination
- Elective
- Elective
- Elective
- Elective

### Fall Year G2
- Elective
- Elective
- Elective
- Elective

### Spring Year G2
- Elective
- Elective
- Elective
- Elective

### Notes:
1. The minimum number of elective credits required is shown. In consultation with their dissertation adviser, students may take additional credits. Elective credits can include BMS 597A Foundations in Biomedical Research. E cannot include any BMS 596, 600, 601, 610, or 611 credits.
2. At least two of the elective credits must be from BMS 520, BCHEM 522, PHARM 520, MICRO 581/582 and at least two elective credits must be from BMS 581, BCHEM 521, PHARM 551/552/553/554, PHARM 561, PHAI GENET 587.
3. VIRIM students must take either MICRO 553 Science of Virology or MICRO 560 Concepts in Immunology. This choice must be made in consultation with the student’s dissertation adviser.
4. To complete the Journal Club requirement, VIRIM students must register for either IBIOS 580 Critical Readings in Immunology (1) in the Fall semester or MICRO 572 Literature Report (1) Fall and/or Spring.
5. The BMS 590 requirement can be satisfied by another approved colloquium course.
5. Seminar and Journal Club Presentations and Attendance

Students in the Program are expected to attend seminars given in the BMS Student Seminar Series. Beginning in Year G2, each student will present a seminar in this series on an annual basis. Students may also be required to give seminars in other series such as the seminar series in the department of their adviser.

Students are also expected to attend presentations given by invited speakers in the BMS Seminar Series. Attendance at other relevant seminars is highly recommended and may be required by the thesis adviser or the department of the adviser. These seminars are excellent opportunities to enhance knowledge of associated fields.

Students are also expected to participate annually in a journal club. Specific departments may require participation in a journal club.

C. Candidacy Examination

1. The USMLE Step 1 Replaces the Candidacy Examination for M.D./Ph.D. Students

Passage of the USMLE Step 1 replaces the requirement for passing the candidacy examination.

2. Approval of the Candidacy Examination Results

After the student passes the USMLE Step 1, the M.D./Ph.D. Program Administrator completes the proper forms and sends them to the Office of Graduate Enrollment Services. The Chair will also provide a written statement attesting to the student's English competence or recommendations for additional studies.

3. What Happens if a Student Fails the USMLE Step 1?

A student who fails the USMLE Step 1 may be given the opportunity to retake it at a future date or may be required to withdraw from the M.D./Ph.D. program depending on their level of performance on the examination and in other aspects of the joint-degree program. The decision of whether to permit a second examination and to determine the appropriate time for its administration is at the discretion of the M.D./Ph.D. Co-Directors. If permitted to retake the examination, the student may proceed with selection of a dissertation adviser and establishment of a doctoral committee. However, the doctoral committee cannot be officially formed until the USMLE Step 1 is successfully completed. If a student fails Step 1 three times, they are dismissed from the medical school and from the M.D./Ph.D. Program. It is at the discretion of the BMS Advisory Committee and the thesis adviser as to whether the student is permitted to continue in the Ph.D. If allowed, the student must take and pass the BMS candidacy examination.

D. Doctoral Committee

1. Members

The student should confer with his/her dissertation adviser when considering members to suggest for their doctoral committee and the committee must conform to the guidelines of the Graduate School (http://bulletins.psu.edu/graduate/degreerequirements/degreeReq1). This committee consists of four or more active members of the Graduate Faculty. At least one committee member must be a member of the M.D./Ph.D. Steering Committee. The Advisory Committee
recommends that five members be appointed to the doctoral committee, particularly in those situations where two members of the committee are from the same research group. The dissertation adviser must be a member of the doctoral committee and usually serves as chair. At least one member of the committee must be an “Outside Field Member” who must represent a field outside the candidate’s major field of study to provide a broader range of disciplinary perspectives and expertise. This member may be from a different department than the dissertation adviser or from a Program or Option different than that of the student. In addition, there must be at least one regular member of the committee whose primary appointment is in an administrative unit outside the unit in which the dissertation adviser’s (and co-adviser’s, on committees with a co-adviser) primary appointment is held. Additionally, this “Outside Unit Member” should have no budgetary connection to the dissertation adviser (and co-adviser). Examples of conflicts of interest that would disqualify someone as the Outside Unit Member include serving as co-principal investigator on grants or other funding sources with the adviser (and co-adviser). The same individual may serve as both the Outside Field and Outside Unit Member if they fulfill the appropriate criteria.

The dissertation adviser submits the suggested names of members for the doctoral committee to the BMS Advisory Committee. All doctoral committees must be approved by the BMS Advisory Committee and reviewed periodically to ensure its members continue to qualify for service in their designated roles.

The doctoral committee meets at least twice a year. The committee-report form with signatures from this meeting (available from the M.D./Ph.D. Program Administrator) must be filed with the BMS Program Office and the M.D./Ph.D. Program Office.

2. Responsibilities of the Doctoral Committee

The doctoral committee is responsible for approving the broad outline of the student’s program and should review the program as soon as possible after the student’s admission to candidacy. Continuing communication among the student, the dissertation adviser, and members of the committee is strongly recommended to preclude misunderstandings and to develop a collegial relation between the candidate and the committee members.

E. English Competency

All M.D./Ph.D. candidates are required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking. The Graduate School requires the Program to formally attest to a student's English competency before the comprehensive examination can be scheduled.

All students are evaluated for their English competency as part of required presentations and writings in BMS 504 and 505, seminar presentations, Colloquium, and other components of the degree program. If the student does not demonstrate acceptable competence based on the above evaluations, the student's adviser will be responsible for providing mechanisms for improving these skills. Examples include: 1) verbal critiques of assigned professional papers, 2) presentations in laboratory meetings, 3) additional presentations in Colloquium, and/or 4) successful completion of specific courses designated by the Advisory Committee and targeted toward written and/or spoken English as appropriate. If remediation is required, the doctoral committee will re-evaluate the student following completion of the required studies and the student's adviser will notify the Program Chair in writing when the student has met the English competency requirement.
F. Comprehensive Examination

1. Purpose of the Comprehensive Examination

Successful completion of the comprehensive examination indicates that the student has a broad and in-depth background in biomedical sciences. It marks the watershed from taking courses to being a full-time researcher. The examination serves to allow the committee to thoroughly examine the student's preparation for dissertation research.

2. When Does a Student Take the Comprehensive Examination?

To schedule and take the comprehensive examination, a student must be registered full or part-time, and must have a GPA of 3.00 as defined for the M.D./Ph.D. degree by the Program (see above). Generally, the comprehensive examination is taken when a student has finished essentially all coursework and is ready to focus on research work for the dissertation. Typically, students take the examination at the end of Year G1 or the beginning of Year G2. It is strongly encouraged not to delay beyond the end of Year G2. At the request of the appropriate Program or Option Director, the Associate Dean of the Graduate School officially schedules the examination. The date, time and place must be agreed upon by the student and all members of the doctoral committee. Once the date, time, and place are determined, and at least three weeks prior to the date, the student must notify the BMS Program Office to schedule the examination through the Office of Graduate Enrollment Services.

3. Who Administers the Comprehensive Examination?

The student's doctoral committee administers the comprehensive examination.

4. Format of the Comprehensive Examination

The examination includes both writing and orally defending a research grant proposal. Specific requirements for the comprehensive examination vary among the curricular tracks. Students should consult the Director of their curricular track for specific guidelines related to the required format. The examination content should be the same as the thesis research project.

5. Who Grades the Comprehensive Examination?

The comprehensive examination is not given a letter grade. Two-thirds of the doctoral committee must agree that the student has passed the examination. If a failure occurs, it is the discretion of the committee to permit a second examination and to determine the approximate time for administration of the second examination. The comprehensive examination will only be given twice. A second failure will result in the withdrawal from Ph.D. candidacy. This information is relayed to the BMS Program Office, which then notifies the Office of Graduate Enrollment Services for official entry into the student's record.

6. What are the Requirements of the Student after Completion of the Comprehensive Examination?

The student must keep the doctoral committee informed of his/her progress by at least two committee meetings per year and completing the committee meeting form following each meeting. The dissertation adviser should be consulted in planning regular meetings of the committee.
G. Dissertation Research

Critical components of Ph.D. training are gaining the abilities to select a worthy research problem, to organize an approach for problem solving, to design and execute meaningful experiments, to interpret results cogently in light of the work of others, and to produce a scholarly exposition in written form. The candidate will assemble an independent body of work during their dissertation research that demonstrates they have gained these abilities.

H. Dissertation Preparation and Final Oral Examination

Both the dissertation adviser and the student are responsible for ensuring the completion of the written dissertation and for adequate consultation with members of the doctoral committee. A formal meeting of the doctoral committee with the student to discuss the written dissertation is required prior to scheduling the final oral examination. The written dissertation should be in its final form, with appropriate notes, bibliography, tables, etc., exhibiting polished content and style, and be reviewed and approved by the adviser for the distribution to committee members at least two weeks prior to the scheduled meeting.

Normally, no less than three months must elapse between the comprehensive examination and final oral examination. Additionally, the graduate program must be completed within six years of passing the comprehensive examination or a second comprehensive examination is required.

After the doctoral candidate has satisfied all other requirements for the degree and upon recommendation of the dissertation adviser and the committee that the written dissertation is acceptable, the Program Chair will submit a request to the Office of Graduate Enrollment Services to schedule the final oral examination. Major revisions to the written dissertation should be completed before scheduling the oral examination and this revised document should be distributed to committee members at least two weeks prior to the final oral examination.

The final oral examination should be a public seminar followed by an oral dissertation defense. The following points may be used as guidelines for evaluation:

- Is the research original?
- Are proper experimental designs, appropriate techniques, and interpretation of results described in the dissertation?
- Is the candidate able to defend the methods, findings, and conclusions of the research?
- Is the candidate sufficiently knowledgeable of the literature to place his or her contribution in proper context?
- Is the dissertation research worthy of publication?

The decision of the committee will be reported to the Program Chair and to the Graduate School on the forms provided by the Graduate School.

I. Time Limitation

A doctoral student is required to complete the program, including acceptance of the doctoral thesis, within eight years from the date of successful completion of the candidacy examination. Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.
M.D./Ph.D. students are required to have at least one first-author publication accepted or published based on their dissertation research prior to the final oral examination.

The final dissertation must be approved by the Office of Theses and Dissertations prior to beginning Year M3.
M.D./Ph.D. Degree Check List

1. Admitted to Graduate School: __________ (date)

2. USMLE Step 1: (typically prior to entering the dissertation research lab)

3. Selection of dissertation adviser and graduate program (typically during Year M2)

4. Recommend members for doctoral committee: (in consultation with dissertation adviser; completed during the first semester of Year G1)
   
   i. At least one member of the M.D./Ph.D. Steering Committee must be on the doctoral committee

   ii. Official appointment of Ph.D. doctoral committee by the Dean of the Graduate School following recommendation by BMS Advisory Committee

5. Committee meetings must be scheduled at least twice a year and the committee-meeting-report form (available from the M.D./Ph.D. Program Administrator) must be filed with the BMS Program Office and the M.D./Ph.D. Program Office.

6. Coursework (variable depending on curricular track and student interests; only core required courses are listed; students should consult Table 1 of this Handbook, their first-year adviser, and http://www.pennstatehershey.org/web/gsa/home/studentresources/current/courses, for required and elective courses for the curricular track(s) of interest)

<table>
<thead>
<tr>
<th>YEAR M1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>Course</td>
<td>Course</td>
</tr>
<tr>
<td>Number</td>
<td>Title</td>
<td>Number</td>
</tr>
<tr>
<td>Fall</td>
<td>Credits</td>
<td>Spring</td>
</tr>
<tr>
<td>Medical</td>
<td>courses</td>
<td>Medical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR M2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>Course</td>
<td>Course</td>
</tr>
<tr>
<td>Number</td>
<td>Title</td>
<td>Number</td>
</tr>
<tr>
<td>Fall</td>
<td>Credits</td>
<td>Spring</td>
</tr>
<tr>
<td>BMS 506A</td>
<td>Biol Basis Disease A</td>
<td>BMS 506B</td>
</tr>
<tr>
<td>Medical</td>
<td>courses</td>
<td>Medical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR G1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>Course</td>
<td>Course</td>
</tr>
<tr>
<td>Number</td>
<td>Title</td>
<td>Number</td>
</tr>
<tr>
<td>Fall</td>
<td>Credits</td>
<td>Spring</td>
</tr>
<tr>
<td>BMS 504</td>
<td>Sci Comm I</td>
<td>BMS 505</td>
</tr>
<tr>
<td>BMS 591</td>
<td>Ethics</td>
<td></td>
</tr>
</tbody>
</table>
7. Complete communication requirements (prior to comprehensive examination).

8. Comprehensive examination (typically prior to the beginning of Year G2; at least 3 months prior to final oral examination) arranged through Program Chair and Dean of the Graduate School.

9. In consultation with dissertation adviser and doctoral committee, determine when dissertation research is nearing completion and you can begin to concentrate on writing your dissertation. The defense should be scheduled for no later than March of the year you plan to return to M3.


11. Activate intent to graduate on eLion during the semester of intended graduation; see Thesis Office Calendar (http://www.gradsch.psu.edu/current/thesis.html); deadline is typically within the first two weeks of the semester.

12. By the semester deadline date (http://www.gradsch.psu.edu/current/thesis.html) submit a draft of the dissertation to the Thesis Office for format review

13. Draft of dissertation submitted to dissertation adviser (at least 4 weeks before anticipated submission to all members of doctoral committee)

14. Copies of the draft dissertation including the abstract consistent with the ProQuest/UMI Agreement (limit 350 words) and vitae (one page maximum) in approved Graduate School form to all members of doctoral committee

15. Reviewed draft dissertation returned to graduate student for correction (within 2 weeks after received)

16. Receive approval from doctoral committee to schedule final oral examination after major corrections are made

17. Schedule final oral examination through BMS Program Office (at least 3 weeks in advance). The final oral examination must be scheduled on a date no later than the published Graduate School deadline for graduation in that semester (http://www.gradsch.psu.edu/calendar/)

18. Public seminar and final oral examination no later than March of the year you plan to return to Year M3

---

<table>
<thead>
<tr>
<th>YEAR G2</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>BMS 601</td>
<td>Thesis Research</td>
<td>0</td>
</tr>
</tbody>
</table>
19. Final revisions to thesis in response to comments from doctoral committee
20. Obtain signatures of dissertation adviser and doctoral committee members on Approval Page
21. Review and approval of dissertation by Program Chair (allow 1 week for review)
22. Submit final dissertation to the eTD Website (http://www.etd.psu.edu/) by the deadline date
23. Submit signed doctoral approval page, ProQuest/UMI Agreement, Survey of Earned Doctorates, and fee (payable at http://www.gradsch.psu.edu/current/thesis.html) to the Office of Theses and Dissertations
24. Acceptance of dissertation by The Graduate School
25. Return to Year M3 of the M.D.-degree program. The earliest date to return is May 1 and the latest date is July 1. NOTE: The final dissertation must be approved by the Office of Theses and Dissertations prior to beginning Year M3.
26. M.D./Ph.D. students are required to have at least one first-author publication accepted or published based on their dissertation research prior to the final oral examination.

NOTE: The student is responsible for meeting all time schedule requirements for their degree.
VI. Concurrent or Dual-Title Degree Programs

The Graduate School of Penn State University permits undertaking concurrent or dual-title degree programs. For example, students can receive Ph.D./M.B.A. concurrent degrees (http://www.pennstatehershey.org/web/gsa/home/educationalopportunities/dual) or a dual-title Ph.D. degree in Biomedical Sciences and Clinical and Translational Sciences (http://bulletins.psu.edu/graduate/programs/C/GRAD%20CTS). Students may file a concurrent degree proposal following successful completion of the comprehensive examination or apply to the dual-title program at the time applications are solicited. Undertaking a concurrent or dual-title degree program requires approval of the dissertation adviser, doctoral committee, the Director of the student’s Program or Option, and the Head of the proposed concurrent or dual-title degree program, as well as approval from the Office of Graduate Enrollment Services. Registration for a concurrent or dual-title degree program may require payment of applicable tuition charges by the student.

VII. General Information

Stipend – Penn State University is a direct-deposit pay only institution. You will receive your stipend at the end of each month.

Taxation of Stipend – This is determined by governmental agencies.

E-mail – Penn State access/e-mail accounts are acquired at Graduate Orientation. All Graduate Education/student information is relayed through Penn State email (that is, your @psu.edu account). Make sure you read your e-mail.

Vacation/Sick Leave – Full-time graduate students in the BMS Graduate Program who receive stipends are permitted two weeks of vacation leave per academic year (July 1 to June 30). Leave should be arranged at least two weeks in advance with consent of the Program Chair (first-year students) or dissertation/thesis adviser (second-year and above students). Students will not be routinely granted vacation leave while enrolled in class work. For extenuating circumstances, special arrangements may be made for additional vacation days. Such arrangements need approval of the Program Chair (first-year students) or the dissertation/thesis adviser (advanced students). Vacation leave days do not accrue from year to year. Holidays designated by The Pennsylvania State University are separate and in addition to vacation days.

No sick leave is formally assigned or earned, but may be used as necessary with approval of the Program Chair (first-year students) or the dissertation/thesis adviser (advanced students). Under normal circumstances, up to five days of sick leave per calendar year will be granted, when necessary. Sick leave in excess of five days will be recorded as vacation time. It is the student’s responsibility to contact the Program Chair or dissertation/thesis adviser when he/she is absent from the classroom or laboratory due to illness.

VIII. BMS Faculty Members

The most up-to-date list of the faculty members of the BMS Program with descriptions of their research interests can be found at http://www2.med.psu.edu/faculty/program-faculty/
IX. BMS Advisory Committee

Ralph L. Keil, Ph.D.
   Chair, BMS Graduate Program; rkeil@psu.edu; 717-531-8595; COM Rm. C5702
Lisa M. Shantz, Ph.D.
   Director, BMS Graduate Program; lms17@psu.edu; 717-531-1562; COM Rm. C4731
John Flanagan, Ph.D.
   Director, BMG Option; jflanagan@psu.edu; 717-531-4189; COM Rm. C5747
Clare Sample, Ph.D.
   Director, VIRIM Option; csample@hmc.psu.edu; 717-531-0003 x287150; COM Rm. C6741
Jong Yun, Ph.D.
   Director, TT Option; jky1@psu.edu; 717-531-1508; HCAR Rm. 3017
Karen Shields
   Program Coordinator; kbp2@psu.edu; 717-531-1045; COM Rm. C1712
Kathy Shuey
   Program Coordinator; kes6@psu.edu; 717-531-8982; COM Rm. C1712
Kristin Smith
   Enrollment Specialist; kec17@psu.edu; 717-531-0003 x285864; COM Rm. C1747J

X. Appendix:
A. Graduate Student Progress – Annual Review Form

_Penn State College of Medicine Graduate Student Progress – Annual Review Form_

<table>
<thead>
<tr>
<th>Student’s name</th>
<th>Student’s number</th>
<th>Date Matriculated</th>
<th>Student’s advisor</th>
</tr>
</thead>
</table>

**Academic Progress**

<table>
<thead>
<tr>
<th>Current GPA</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
</tr>
</thead>
</table>

Written English Requirement completed

<table>
<thead>
<tr>
<th>Candidacy examination</th>
<th>1st attempt</th>
<th>Date</th>
<th>Pass/Fail</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd attempt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spoken English Requirement completed

<table>
<thead>
<tr>
<th>Comprehensive examination</th>
<th>1st attempt</th>
<th>Date</th>
<th>Pass/Fail</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd attempt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Doctoral committee formed:

**Thesis Committee Meetings**

<table>
<thead>
<tr>
<th>Committee Meeting #1</th>
<th>Committee Meeting #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Student Summary of Committee Meeting Submitted</td>
</tr>
</tbody>
</table>

| 2nd year | | |
| 3rd year | | |
| 4th year | | |
| 5th year | | |
| 6th year | | |

**Thesis Research Progress**

<table>
<thead>
<tr>
<th></th>
<th>O</th>
<th>E</th>
<th>S</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Overall Progress**

<table>
<thead>
<tr>
<th></th>
<th>O</th>
<th>E</th>
<th>S</th>
<th>U</th>
<th>Comments Appended?</th>
<th>Advisor</th>
<th>Student</th>
<th>Date</th>
<th>Program Director</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Unsatisfactory Overall Progress must be accompanied by a letter from the mentor describing the problem(s).*