

## **BMS Graduate Program**

### **A. ADMISSION**

The Department will consider applications received through the Graduate Admissions Office from individuals holding a baccalaureate degree in the biological or physical sciences or a Doctor of Veterinary Medicine degree from any accredited college or university in the United States or a recognized institution in another country whose requirements for the baccalaureate or professional degree are substantially equivalent to those at Iowa State University (ISU). Undergraduate courses in anatomy, physiology, cellular and molecular biology, physics, chemistry, biochemistry, and calculus are highly recommended. Each application is evaluated by the departmental faculty and must include: 1) official college transcripts; 2) official GRE scores; 3) official Test of English as a Foreign Language (TOEFL) score of at least (550 paper-based; 197 computer based; 79 internet based) or an official International English Language Testing System (IELTS) score of at least 6.5 (required only for international applicants - waived for native English speakers and students graduating from countries where English is the official language); 4) Biomedical Sciences departmental application; 5) Graduate College application; 6) personal statement and résumé; and 7) three letters of recommendation.

### **B. REGISTRATION**

*Refer to the ISU Graduate Student Handbook.*

### **C. SELECTION OF MAJOR PROFESSOR (for students pursuing Ph.D. and M.S. with thesis)**

A student entering the department with a general or specific concept of her/his choice of

research area may be in a position to immediately select a major professor. During the first and possibly the second semester of graduate study, graduate students may rotate through the research laboratories of departmental faculty members. These rotations, which can be taken for credit (BMS 501), will introduce the student to the techniques and areas of interest of the faculty, and assist the student in selecting a major professor. In this situation, the Director of Graduate Education (DOGE) will serve as temporary advisor until a major professor is chosen. The student should familiarize herself/himself with laboratories and research projects within the department.

***D. COURSES AND NUMBER OF CREDITS REQUIRED FOR THE M.S. (WITH THESIS) AND Ph.D. DEGREES.***

- M.S.(with thesis) At least 30 credits of acceptable graduate work must be completed; at least 22 of those credits must be earned from Iowa State University. Up to 10 credits of dual-listed professional courses may be applied for major graduate credit.
- Ph.D. A minimum of 72 credits must be earned for a Ph.D. At least 36 credits, including dissertation research, must be earned at Iowa State University. Up to 10 credits of dual-listed professional courses may be applied as major graduate credit.
- Required courses for all graduate students in Biomedical Sciences for both M.S. (with thesis) and Ph.D. students\*

i. Biochemistry: BBMB 405 (Biochemistry, 3 Cr.) or BBMB 420 (Physiological Chemistry, 3 Cr.), or BMS 335 (Molecular and Cellular Basis of Disease, 1 Cr) and BMS 336 (Veterinary Nutrition, 2 Credits)

- ii. Statistics: Statistics 401 (Statistical Methods for Research, 4 Cr.) or equivalent
  - iii. Literature and Research Review: BMS 688 (2 Cr. for M.S. and 4 Cr. for Ph.D. students)
  - iv. Seminar: BMS 698 (1 Cr.) Students are required to take this course each semester during their residence. During the last semester of residence, students are required to present a seminar before their oral final exam.
  - v. Research: BMS 699 (1-3 Cr.) A) Anatomy, B) Physiology, C) Pharmacology, D) Cell Biology.
- d. Course requirements for different areas of specialization.
- i. Anatomy: Two from the four following courses: BMS 530 (Principles of Morphology, I, 5 Cr.); BMS 531 (Principles of Morphology, II, 4 Cr.); BMS 547X (Principles of Anatomy, 5 Cr.); BMS 537 (Neuroanatomy, 3 Cr).  
Required unless the graduate student has had sufficient formal anatomy training (determined by examinations given by the instructors-in-charge of BMS 530, BMS 531, BMS 537 and BMS 547X)
  - ii. Cell Biology: BMS 575 (Cell Biology, 3 Cr.) and BMS 533 (Biomedical Sciences I, Cr 6); or BMS 575 (Cell Biology, 3 Cr.) and BMS 538X (Principles of Physiology, 4 Cr.). Required unless the graduate student has had sufficient formal training (determined by examinations given by the instructors-in-charge of BMS 575, BMS 533, and BMS 538X ).
  - iii. Physiology: BMS 533 (Biomedical Sciences I, Cr 6) or BMS 534 (Biomedical Sciences II, Cr 6); or BMS 575 (Cell Biology, 3 Cr.) and BMS 538X (Principles of Physiology, 4 Cr). Required unless the graduate student has had

sufficient formal physiology and cell biology training (determined by examinations given by the instructors-in-charge of BMS 533, BMS 534, BMS 538X and BMS 575).

- iv. Pharmacology: BMS 538X (Principles of Physiology, 5 Cr.) and either BMS 554 (General Pharmacology, 3 Cr) or BMS 539X (Principles of Pharmacology, 4 Cr.). Required unless the graduate student has had sufficient formal training in physiology and pharmacology (determined by examinations given by the instructors-in-charge of BMS 554, BMS 539X, BMS 533 and BMS 539X).

\* The Program of Study (POS) Committee may require additional courses.

\* Equivalency of courses are determined by the POS Committee and submitted to the Department Chair for approval.

\* Transfer credits ("B" grade or better) from another institution must be listed on the POS form and approved by the POS Committee.

#### 5. **PROGRAM OF STUDY COMMITTEE for M.S. with thesis and Ph.D. degree**

The Department recommends that the student's Program of Study (POS) Committee be established during the first year in residence. The POS Committee for M.S. and Ph.D. degrees consists, respectively, of at least 3 or 5 members of the Graduate Faculty. See the ISU Catalog (ISU Bulletin or ISU Graduate Student Handbook) for details.

#### 6. **PROGRAM OF STUDY**

The Program of Study (POS) is developed by the student and their major professor in consultation with the POS Committee, and should be submitted for approval by the end of

the second semester in residence. The POS form lists courses that the student and the POS Committee have agreed the student must complete for the degree sought. A preliminary research plan should be proposed concurrently with POS form submission.

***E. COURSES AND NUMBER OF CREDITS REQUIRED FOR THE NON-THESIS M.S. BIOMEDICAL SCIENCES DEGREE***

A minimum of 30 credits is required. The required courses (28 Cr, see below) must be completed for the non-thesis M.S. degree. The additional credits required (2 Cr) shall include any graduate level course approved by the POS committee.

1. BMS 547X (Principles of Anatomy, 5 Cr.)
2. BMS 538X (Principles of Physiology, 4 Cr.)
3. BMS 539X (Principles of Pharmacology, 4 Cr.)
4. BMS 575 (Cell Biology, 3 Cr.)
5. BMS 502X (Methods in Biomedical Sciences, 3 Cr.)
6. VPth 503X (Principles of Pathology, 3 Cr.)
7. VMPPM 501X (Principles of Microbiology, 3 Cr.)
8. BMS 599 (Creative Components, 2 Cr.)
9. BMS 698 C Seminar, 1Cr (Fall and Spring semester)

**7. ACADEMIC STANDING**

Students are required to maintain at least a 3.00 grade point average (on a 4.00 scale) for all courses taken, with the exclusion of research credits.

**8. EXAMINATIONS (for thesis M.S. and Ph.D. degrees; no comprehensive final exam for**

*non-thesis M.S. students)*

a. QUALIFYING EXAMINATIONS

The department does not require a qualifying examination. The POS Committee may require that a written examination be taken before the oral preliminary examination.

b. THE Ph.D. ORAL PRELIMINARY EXAMINATION

This examination must be completed at least six months before the final defense of the dissertation. The oral examination is conducted by the student's POS Committee. At the completion of the oral preliminary examination, the POS Committee will recommend one of the following:

- i. The student be admitted to candidacy.
- ii. The student may continue studies but must meet certain conditions to be admitted to candidacy.
- iii. The student fails but will be given the opportunity to repeat the examination, usually six months after the first attempt.
- iv. The student fails and is not permitted to continue to work toward a Ph.D. in Biomedical Sciences at Iowa State University.

\* It is strongly recommended that the preliminary exam be taken as soon as course work is completed and a general research plan is developed. This would normally be 1-2 years before the oral final examination.

c. ORAL FINAL EXAMINATION

- i. The ORAL FINAL EXAMINATION FOR THE MASTER'S THESIS is

scheduled two or more weeks after the thesis has been submitted to the Thesis Office and circulated to the student's POS Committee members. The purpose of this examination is to test the student's grasp of the subject matter, and as a defense of the thesis. The student's Major Professor will announce the time and location of the thesis defense.

- ii. The DEFENSE OF THE Ph.D. DISSERTATION is an oral examination conducted by the POS Committee. The examination is scheduled two or more weeks after the dissertation has been submitted to the Thesis Office and circulated to the student's POS Committee members. The student's Major Professor presides over the proceedings and ensures that the defense is concerned with the scientific merits of the dissertation. If the candidate fails, the POS Committee recommends appropriate action to the Department Chair. A second examination is provided as required by the Graduate College.

## **9. THESIS AND DISSERTATION FORMAT**

Refer to the Graduate College's publication: Requirements of Graduate Thesis.

## **10. OTHER DEPARTMENTAL POLICIES**

### **o TEACHING**

Many students who complete the Ph.D. degree seek positions as members of university faculties. Hence, students are encouraged to participate in laboratory

discussions and class lectures with faculty supervision.

- FINANCIAL SUPPORT

Teaching assistantships are awarded on a competitive basis. To the extent that funds are available, the department will attempt to provide financial support to students in good standing. Research assistantships are awarded at the discretion of individual faculty members.

- TRAVEL POLICY

Attendance and presentation of papers at national scientific meetings are beneficial for the training of students. Thus, the department will attempt to provide graduate students with some financial assistance for travel and registration. Priority will be given to students presenting papers.

- TIME SCHEDULE

It is strongly recommended that a major professor be identified and a POS committee be developed following completion of the laboratory rotations, usually during the second semester of graduate study. This committee should be set up by the graduate student in consultation with their major professor, the Director of Graduate Education, and Department Chair.

- REQUIREMENTS FOR STUDENTS IN INTERDISCIPLINARY PROGRAMS/MAJORS

Graduate students enrolled in an interdisciplinary major, such as Molecular, Cellular and Developmental Biology, Neuroscience, or Toxicology, are required to complete all requirements for that major.