

The background features a large, semi-transparent watermark of the University of South Carolina logo. The logo is circular and contains a stylized palmetto tree in the center, with the words 'UNIVERSITY OF SOUTH CAROLINA' and the year '1789' visible within the design.

**UNIVERSITY  
OF SOUTH  
CAROLINA  
BIOMEDICAL  
SCIENCE®  
PhD MANUAL**

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# Introduction

The University of South Carolina School of Medicine PhD Program in Biomedical Science is a cooperative effort between the School of Medicine basic science departments including:

- Cell Biology and Anatomy
- Pathology, Microbiology and Immunology
- Pharmacology, Physiology, and Neuroscience

The course of study in this program leads to the degree of Doctor of Philosophy. The student receives extensive theoretical and practical training in the biomedical sciences. The goal of this program is to prepare students to become productive biomedical researchers and highly qualified educators.

During the first and second years in the program, students are expected to divide their time profitably between course-work and creative research. During this time, students are enrolled in didactic course-work and are also expected to perform research; summers are usually dedicated primarily to research. In the first year, the student will enroll in Core Courses and choose several laboratories in which to gain practical research experience through research rotations. By the end of the second semester of their first year, the student will select a major professor and home department. Students select a home department according to the affiliation of their research mentor and until such a decision has been made are considered “at large” and under the guidance of the Director of the Biomedical Graduate Programs and the Graduate Advisory Committee.

Stipends are typically provided to Biomedical Science PhD students. These are full-time research assistantships and it is anticipated that students will make a significant contribution to any laboratory in which they are involved. After completion of course-work, the student’s prime commitment is to laboratory-based dissertation research.

The first year of course-work consists of a Core Curriculum that varies slightly depending upon which of the following two concentrations students enroll:

- Cell and Molecular Biology concentration
- Neuroscience concentration

Once students select a research mentor, additional specialized course work is defined by the mentor, the department and the student’s advisory committee.

The Director of the Biomedical Science Graduate Program will monitor and aid the progress of students through the Program. The requirements that shall apply to each student shall be those in force at the time of admission; if the program is altered after the student is admitted, the student shall have the choice of complying with the new requirements and regulations or those in place at the time of admission. **It is the student’s responsibility to know the requirements of the PhD program and to ensure that the requirements are met.**

# Administration

The School of Medicine Biomedical Science Graduate Program follows the general academic regulations of the Graduate School as described in the University of South Carolina Academic Studies Bulletin ([www.sc.edu/bulletin](http://www.sc.edu/bulletin)). In addition, specific requirements of the Biomedical Science Graduate Program are described in this manual.

## 1. Program Administration

Within the School of Medicine, the Biomedical Science Graduate program is administered by the Director for the Biomedical Sciences Graduate Program. The Director for the Biomedical Sciences Graduate Program, in consultation with the Graduate Advisory Committee and Graduate Curriculum Committee, is also responsible for developing and maintaining the curriculum and managing admission. The Biomedical Science Graduate Advisory Committee consists of one representative from each of the participating School of Medicine departments and two PhD students. This committee is responsible for establishing policies and procedures consistent with University and School of Medicine guidelines and for ensuring that program requirements are met. The Graduate Curriculum Committee is composed of faculty representatives from each of the Basic Science departments. The Office of Graduate Studies maintains student files and required graduate forms and is located in Building 3 of the School of Medicine.

Director, Biomedical Graduate Program	Dr. Edie Goldsmith	216-3809
Program Coordinator	Ms. Ansley Roberts	216-3321
Administrative Assistant	Ms. Gloria Price	216-3321
Financial Coordinator	Ms. Judy Lawrence	216-3312
Assistant Director for Student Services	Mr. Jerel Arceneaux	216-3629

## 2. Departmental Administration

The Chairman of each participating department selects one faculty member to serve as its departmental representative to handle graduate affairs and to serve on the Biomedical Science Graduate Advisory Committee. The current department representatives are:

Cell Biology and Anatomy	Dr. Holly LaVoie
Pathology and Microbiology	Dr. Angela Murphy
Pharmacology, Physiology, and Neuroscience	Dr. Lawrence Reagan

## 3. Academic Responsibility, *Carolina Community* and The Office of the Ombudsperson

The USC Student Handbook and Policy Guide, *Carolina Community*, is located at the USC Graduate School website ([www.gradschool.sc.edu](http://www.gradschool.sc.edu)). In addition to describing aspects of student life, this publication also contains the *Carolinian Creed* and associated policy on Academic Responsibility to which all students must adhere. Students in the Biomedical Science Graduate Program are expected to adhere to the University Rule of Academic Responsibility. This Rule is concerned with infractions of academic discipline or ethical conduct and prohibits plagiarism, cheating, and falsification of data.

The educational program in the School of Medicine has been developed to support and encourage the collegiality and professionalism essential to an effective learning environment. Students who believe that they have been punitively assessed or mistreated because of religion, race, ethnicity, gender, sexual orientation, age or other factors have access to the School of Medicine

Ombudspersons who are empowered to receive and investigate reports of mistreatment in a completely confidential manner, to mediate between the parties involved and, in the event mediation is not successful, to make recommendations directly to the Dean of the School of Medicine regarding appropriate resolution of any complaints. The use of the Ombudspersons' services to resolve a complaint represents a form of alternate dispute resolution. For this reason the services of the Ombudsperson will no longer be available to a student once that student engages an attorney to initiate legal action against the School of Medicine, the University of South Carolina, or the employees of those institutions. The current Ombudspersons are: Dr. Lawrence Reagan ([Lawrence.Reagan@uscmed.sc.edu](mailto:Lawrence.Reagan@uscmed.sc.edu)) and Dr. J. T. Thornhill [Joshua.Thornhill@uscmed.sc.edu](mailto:Joshua.Thornhill@uscmed.sc.edu).

## Degree Requirements

## 1. Admissions

Applicants can apply to the Biomedical Sciences PhD program using the USC ApplyWeb system (<https://biomedical.med.sc.edu>). An applicant must have a baccalaureate degree or its equivalent from an accredited college or university. Undergraduate courses should include two semesters each of biology, physics, inorganic chemistry, and organic chemistry as well as some math (preferably through calculus).

Admission to the Biomedical Sciences Ph.D. program is determined by the Dean of The Graduate School after recommendation by the Biomedical Sciences Graduate Director and the Biomedical Sciences Graduate Advisory Committee. Criteria examined include an appraisal of courses taken, grades achieved, letters of recommendation, research experience, scores on the Graduate Records Examination (GRE), and the student's statement of purpose for graduate study. A MS degree in a biomedical subject or biotechnology, although not required, makes an application more competitive. Highly ranked domestic applicants are invited to interview and visit the university. Selected overseas applicants receive a telephone interview.

A Grade Point Average (GPA) of 3.00 or better is required in both the major and overall. GRE scores on the general Verbal and Quantitative sections above the 50th percentile are also required. A minimum TOEFL score of 100 (out of 120) is also required by the USC Graduate School for students whose native language is not English; however, a score of 110 or above is preferred.

## 2. Interim Advisor

Following admission to the PhD program, the Biomedical Science Graduate Program director will serve as Interim Advisor to PhD students until they have selected a major professor. The interim advisor will be available to assist the student in the selection of initial courses and in the selection of laboratory rotations. The interim advisor will also ensure that all early requirements are met. At all stages in the student's participation in the graduate program, the interim advisor will try to ensure the smooth progress of the student through the program. A permanent graduate faculty advisor or mentor, usually the research advisor, should be appointed as soon as an area of research is identified but no later than the "Candidacy Exam" (usually at the end of the first academic year).

## 3. Transfer Credits and Course Substitution

Applicants with previous graduate or medical training may request advanced standing to reduce course requirements so that the time to complete a degree is reduced. Students may be excused from repeating courses in the Biomedical Science Program when a similar graduate course has been taken elsewhere within the past five years. In general, students will not be excused from Core Courses. The student should consult with the Graduate Director as soon as possible after admission to discuss transfer of courses into the PhD program. Decisions regarding transfer of graduate credits are decided by the Graduate Advisory Committee. Students will be asked to provide information about the course including a course description, syllabus, credit hours, and required tests. In some cases, a competency exam may be recommended as a condition of course waiver. It is unlikely that transfer of credits will be allowed from colleges or universities whose standards are unknown to the faculty of the School of Medicine. Note that USC Graduate School policy requires that **all course-work including transfers must be no more than eight years old when the PhD degree is awarded**. Under no circumstances should the number of transfer hours represent more than fifty percent of the total "didactic" hours required for the Biomedical Science

PhD degree. In addition, the grades of transferred courses will not apply to the GPA at the University of South Carolina.

#### 4. Academic Regulations

##### a. *Grades and Academic Progress*

Graduate courses may be passed for degree credit with a minimum grade of C, but the student's average on all courses attempted for graduate credit **must be at least B** (3.0 on a 4 point system). Core courses completed with a grade below a C must be repeated until a grade of C or better is obtained. Graduate students whose cumulative grade point average drops below **B** (3.00) will be placed on academic probation and allowed one calendar year in which to raise the grade point average to at least 3.00. **Students who do not reach a cumulative 3.00 grade point average during the probationary period will not be permitted to enroll for further graduate course work in that degree program.** Appeals for reinstatement to degree candidacy may be made first to the Biomedical Science Graduate Program. These will be reviewed by the Graduate Advisory Committee and, if approved, forwarded to the Dean of the Graduate School.

##### b. *Pass-Fail Option*

This option is available for courses whose content is related to the Program of Study, but in an area requiring different training or background. The past-fail option permits enrichment of a student's experience without affecting the grade point average.

##### c. *Curriculum*

The Biomedical Sciences PhD degree requires a minimum of **62 credit hours beyond the baccalaureate** and a **minimum of 30 hours beyond the master's degree**, including at least 12 credit hours of dissertation preparation (BMSC 899). A student may use no more than 30 hours combined of research credit [including thesis preparation (799), dissertation preparation (899) and research (780)] as part of the 62 credit hours. At least 32 credit hours must be "didactic" or non-research credits. Doctoral degree students must complete at least half of their hours in courses numbered 700 or higher. The course-work in the Biomedical Science PhD program includes a Core Curriculum and elective courses in the candidate's area of specialization.

The curriculum includes multiple training components designed to prepare students for their dissertation research and for a career in biomedical science. The curriculum includes the following general components:

- A core set of basic science courses that vary slightly depending on the concentration chosen by the student (Cell and Molecular Biology or Neuroscience). The concentrations are sufficiently similar in content such that a student may switch concentrations, if required.
- A multidisciplinary laboratory course (BMSC 700) that provides the student with necessary research safety training and exposes the student to professional development topics.
- An ethics course (BMSC 706) which addresses topics important in biomedical research including human subjects, animals in research, authorship, plagiarism and others.
- Advanced elective course work in specific areas of specialization such as neuroscience, developmental biology, immunology, molecular biology and cancer, reproductive biology, and cardiovascular sciences. Elective courses should be chosen in consultation with the student's mentor and PhD Advisory Committee.

The Academic Bulletin of the USC Graduate School (available at [www.gradschool.sc.edu](http://www.gradschool.sc.edu)) provides a list and brief description of all graduate courses offered by the University of South Carolina, arranged by graduate program and department. The Master Schedule (accessed from the Registrar's website) lists which courses are offered in a given semester, as well as meeting time, place, and instructor. In order to satisfy program requirements, the courses below constitute the required Core Curriculum for the two biomedical science concentrations:

### **MOLECULAR AND CELLULAR BIOLOGY CONCENTRATION**

- An advanced biochemistry course including either Biomedical Biochemistry (BMSC 754) or Biological Chemistry (BIOL 717) – 3 or 4 credit hours
- Interdisciplinary Laboratory (BMSC 700) - 1 credit hour
- Ethics in Biomedical Research (BMSC 706) – 2 credit hours
- An advanced cell biology course including either Human Cell and Molecular Biology (BMSC 702) or Advanced Cell Biology (BIOL 714) – 3 credit hours
- Seminar in Biomedical Sciences (BMSC 801) - 2 credit hours per semester

The student is expected to attend the weekly Biomedical Sciences Seminar Series each semester and should register for BMSC 801. The remainder of the courses required in the Molecular and Cellular Biology Concentration are electives and should be decided through discussion between the student, major professor and PhD Advisory Committee. Elective courses can be selected from 500 level or higher classes offered across the university. Note that at least half of the courses on the student's Program of Study should be 700 level or higher. Generally, students should have completed all of their didactic courses by the end of their second year in the PhD program.

### **NEUROSCIENCE CONCENTRATION**

- Fundamental Neuroscience I (PHPH 750) – 4 credit hours
- Fundamental Neuroscience II (PHPH 751) - 4 credit hours
- Biomedical Biochemistry (BMSC 754) – 4 credit hours
- Interdisciplinary Laboratory (BMSC 700) – 1 credit hour
- Ethics in Biomedical Research (BMSC 706) – 2 credit hours
- Seminar in Biomedical Sciences (BMSC 801) – 2 credit hours per semester

Following completion of the Fundamental Neuroscience courses, which provides a comprehensive and broad-based foundation in neuroscience, **Neurobiology of Disease Modules** (PHPH753 series) will be available as electives to students in the Neuroscience Concentration. Neurobiology of Disease modules focus on different disease states including Anxiety, Depression, Epilepsy, Chronic Pain, Aging and Degenerative Diseases, and Schizophrenia. Modules are focused on understanding and integrating the clinical, basic, technical and ethical issues surrounding specific neuropathological conditions.

PHPH753A: Stress, Anxiety Disorders and the Amygdala

PHPH753B: Stress, Depression and the Hippocampus



- PHPH753C: Degenerative diseases of old age
- PHPH753D: Chronic Pain & Analgesia
- PHPH753E: Schizophrenia, Prefrontal Cortex & Executive Function
- PHPH753F: Epilepsy

The Neuroscience Concentration also includes a series of career development courses in PHPH 742. This is a 1 credit hour seminar course offered each semester and focuses on different topics to provide students with critical skills for success as graduate students and beyond. Topics include: scientific writing, grant writing & critical thinking skills, presentation methods, and professional development perspectives.

***Other potential elective courses:***

- BMSC 702 & 705 Medical Cell Biology I & II;
- CHEM 751, 752 & 753 Biochemistry;
- PHPH 701 Physiology for the Health Sciences;
- PHPH752E Physiology for neurobiologists
- PHPH752I Special Topics in Neuroscience

**SUMMARY OF NEUROSCIENCE CONCENTRATION**

	<b><i>Core courses or electives</i></b>	<b><i>Other Courses</i></b>
<b><i>Fall Yr 1</i></b>	Fundamental Neuroscience (PHPH 750)	Interdisciplinary Laboratory (BMSC 700) Ethics in Biomedical Research (BMSC 706) Neuroscience seminar:-Scientific writing (PHPH 742)
<b><i>Spring Yr 1</i></b>	Fundamental Neuroscience II (PHPH 751)	Neuroscience Seminar: Career Development (PHPH 742) Elective(s)
<b><i>Fall Yr 2</i></b>	Physiology for Neurobiologists and other additional Neurobiology of Disease modules (PHPH753)	Neuroscience Seminar: Grant writing (PHPH 742) Electives: Protein Biochemistry, Medical Cell Biology or Nucleic acid Biochemistry
<b><i>Spring Yr 2</i></b>	Neurobiology of Disease modules (PHPH753)	Anatomical Methods (MCBA 740 - this is training in Instrumentation Resource Facility)

## 5. Selection of a Major Professor or Mentor

One of the most important decisions to be made in graduate school is the selection of a mentor. The typical PhD student will spend 3-4 years in the mentor's lab performing their dissertation research. It is essential that the student and mentor consider this decision carefully to make sure they share common research interests and to make sure the student is well suited for the environment of the mentor's laboratory. Performing research rotations provides an important opportunity to evaluate these issues prior to joining a laboratory.

In the first semester, students are expected to familiarize themselves with the research interests of the faculty in the Biomedical Science Graduate Program. To facilitate this process, symposia will be scheduled at the beginning of the first semester with potential mentors. Students are required to attend these symposia and are encouraged to meet with faculty whose research they find interesting. Students should read recent publications from the laboratories they are considering joining for a research rotation. They should also attend the Graduate Student seminars to learn more about research in the School of Medicine laboratories and discuss potential mentors with senior graduate students.

### a. *Laboratory Rotations*

A laboratory rotation will usually consist of 6-8 weeks of research experience working in a faculty member's laboratory. This may consist of a small independent project or of a component of an on-going project. A student who undertakes a laboratory rotation with a faculty member is under no obligation whatsoever to continue dissertation research with that professor. Similarly, the faculty member is under no obligation to accept the student into their laboratory on a permanent basis at the conclusion of the rotation. A student will usually perform at least two rotations in his/her first year in the PhD program. Upon identifying a laboratory for a rotation(s), students must complete Form 1 (see Appendix) and return it to the Program Coordinator (Ms Roberts) in the School of Medicine Graduate Office.

### b. *Selection of a Major Professor*

The selection of major professor is by mutual agreement and is formalized by submission to the School of Medicine Graduate Office a completed "Selection of Major Professor" form (Form 2, see Appendix). This form should be signed by the student, major professor, department chair and graduate director.

Except under extenuating circumstances, the student should formally affiliate with a major professor by the end of the second semester of graduate study. It is important that the selection of a major professor be an informed decision by the student and advisor. The symposia given at the beginning of the first semester by potential advisors to showcase their research interests will give students the opportunity to identify faculty with whom they share an interest. Rotations allow the student and faculty to determine on a trial basis whether they can work productively in a student/mentor relationship and whether the student can commit to a specific area of research.

The choice of a major professor by a graduate student and the acceptance of the role of major professor by a faculty member are important decisions that imply a certain sense of obligation on both sides. The student should carefully evaluate all facets of the research laboratory they plan to join including research topic and approach, productivity of the mentor and lab members, social environment within the laboratory and funding available to the student. Students should note that only "Graduate Faculty" can serve as PhD mentors. This includes all tenured and

tenure-track faculty in the School of Medicine basic science departments. In general, nontenure-track faculty are not eligible to be primary mentors of record to PhD students.

### *c. Changes in Major Professor*

The choice of a major professor is normally made with every intention of that being a final decision. However, it is appreciated that a student may decide that the choice was inappropriate; therefore, a mechanism exists for changing the major professor. It is pointed out to the student that this is not a decision to be taken lightly. It will almost certainly delay the progression to the PhD degree as it likely will be necessary to develop a new dissertation research program and have it approved.

In the event that a graduate student deems a change of major professor necessary, the following procedures should be followed:

- 1) The student and the advisor should attempt to reconcile their misunderstandings and differences, or, if they mutually agree that a change is advisable, they should arrange for a mutually satisfactory transition.
- 2) If initial attempts at reconciling differences are unsuccessful, the student and faculty member should confer with the student's PhD Advisory Committee and attempt to reconcile their differences.
- 3) In the event that no solutions emerge from these deliberations, the Director of the Biomedical Sciences Graduate Program will serve as an intermediary to arrange a mutually satisfactory transition.

## **6. Qualifying Examination and Admission to Candidacy**

The USC Graduate School requires that all doctoral students be formally admitted to candidacy at least one year prior to awarding of the doctoral degree. Admission to Candidacy requires: 1) full admission to the Biomedical Science PhD program (i.e. removal of any conditions or registration holds), 2) successful completion of a **Qualifying Examination** and 3) submission of a **Doctoral Program of Study**.

The format and administration of the Qualifying Exam is at the discretion of the student's department. This varies from written summaries of the student's research rotation to an examination covering the student's required first-year courses. The Qualifying Exam should be completed soon after the second semester in the PhD program.

Upon obtaining satisfactory results in the Qualifying Examination(s), the student is deemed to have passed the requirement for Admission to Candidacy. The student and their PhD major professor/ mentor (or departmental graduate director) should complete the Qualifying Exam Verification form obtained from the Forms Library on the USC Graduate School website (<http://gradschool.sc.edu/forms/>). A copy of this form should be turned in to Ms. Ansley Roberts in the School of Medicine Graduate Programs Office and the original taken to the USC Graduate School.

## **7. PhD Advisory Committee**

As soon as possible after the Qualifying Examination is passed, the student and the major professor/mentor should select a PhD Advisory Committee. The student should contact potential committee members and discuss the responsibilities of the faculty member and obtain their commitment to participate. The student should complete the Graduate School's Doctoral Committee Appointment Request Form (G-DCA) listing the committee members and turn this in to the School of Medicine Graduate Office. This form may be obtained from the Forms Library of the Graduate School's website (<http://gradschool.sc.edu/forms/>). The student's advisor should be listed on the form as the chair of this committee although another committee member

will function as chair of advisory meetings. Comprehensive and dissertation examination committees are also reported on this form, either at the time of formation of the advisory committee or later when these committees are needed (note that these committees may contain all the same members). The major professor must be a full-time USC School of Medicine faculty member and be a member of the USC Graduate Faculty (generally tenured or tenure-track faculty). The PhD Advisory Committee will consist of at least five faculty members:

- The major professor
- Two members from the major professor's department
- One member of another department of the School of Medicine Basic Sciences
- At least one faculty member from outside the Biomedical Science Graduate Program. The outside member(s) may be a faculty member(s) from another unit of the University of South Carolina or may be a faculty member from another university.

At least half of the student's Advisory Committee must be regular members of the Graduate Faculty (tenured or tenure-track faculty). Other members can be "term appointed" members of the Graduate Faculty who have been given permission to participate on doctoral committees. **If the outside member is not a faculty member at USC, the individual must be nominated by the Biomedical Science Graduate Program to the Dean of the Graduate School.** The nomination must be accompanied by the nominee's curriculum vitae. The nomination should explain how the nominee's research expertise is relevant to the PhD candidate's dissertation research plan.

The PhD Advisory Committee shall be responsible for approval of the student's program of study, Comprehensive Examination, dissertation research proposal and the final dissertation. In addition, the Advisory Committee is responsible for monitoring the student's research progress through conferences or seminars. The Committee Chair will be responsible for notifying the Office of Graduate Studies of all official actions of the Committee. An 80% positive vote is required for approval of any action by the Advisory Committee. The student and their PhD Advisory Committee should meet routinely to discuss the student's progress in the program. How frequently meetings should occur is at the discretion of the student and committee; however, it is suggested that this be at least twice each year.

It is anticipated that the composition of the Advisory Committee will change only if there is a change in direction of research by the student, in which case an additional member with expertise in that area may be requested to join the committee, and a member who was appointed because of an area of expertise which is no longer relevant may volunteer to resign. If a student changes his major advisor, a new Advisory Committee will be appointed.

## 8. Program of Study

All doctoral candidates must complete a Doctoral Program of Study Form, which contains the list of courses that the student is seeking to apply to their doctoral degree. This should be completed by the end of the student's third semester in the PhD program. A Doctoral Program of Study form (DPOS) should be obtained from the USC Graduate School Forms Library (<http://gradschool.sc.edu/forms/>) and completed specifying all courses the student will be required to take to complete degree requirements. This should be discussed with the PhD Advisory Committee at the first meeting between the committee and the student. The form must be signed by the student, the advisor, and the Director of the Biomedical Sciences Graduate Program. The signed Doctoral Program of Study form should then be sent to the Office of Graduate Studies for signature and forwarded to The Graduate School, where it becomes a permanent record of approved courses. No deviations from this program will be allowed without approval by the student, the advisor, the Director for the Biomedical Sciences Graduate Program and the Dean of the Graduate School. A Request for Adjustment in Graduate Program form is available for changes to the Doctoral Program of Study from the Forms Library of the Graduate School's website.



## 9. Comprehensive Examination

The Biomedical Science PhD Comprehensive Examination will be composed of written and oral components. The student must successfully complete both components to pass the Comprehensive Examination. The Comprehensive Exam will be composed of a “mock” research proposal written and orally defended by the student. The student’s PhD Advisory Committee will determine exactly when the Comprehensive Exam will be administered. However, it should be after the majority of the course work is completed, which is typically after the fourth semester in the program. **Except under extreme circumstances, the Comprehensive Exam should be completed prior to the end of the first semester (typically fall) of the student’s third year in the PhD program. Failure to meet this deadline will result in the graduate program rescinding tuition support. Payment of the following semester’s tuition would then be the responsibility of the student’s major professor or the student.**

The procedure for choosing a Comprehensive Examination topic may vary slightly by department or PhD Advisory Committee. The student should clarify the procedure desired by the Advisory Committee prior to proceeding. Typically, the student will convene a meeting of his/her Advisory Committee. At this meeting, the student should present an overview of one or more potential Comprehensive Examination topics. It is advisable that the student provide the Advisory Committee members with a brief abstract of the topic(s) prior to the committee meeting. The topic selected for the Comprehensive Exam should not be directly related to the student’s research or the research in the laboratory of his/her advisor. The PhD Advisory Committee will decide if the topic is sufficiently distinct from the student’s dissertation research. Although the precise format of the final typed proposal will be at the discretion of the PhD Advisory Committee, it is recommended that it be in the form of an NIH style grant proposal which will include: 1) an overview of the literature including significance of the project and 2) a research proposal including hypothesis, specific aims and experimental design.

Upon approval of the Comprehensive Examination topic, the student will have up to six weeks to complete the written examination (mock proposal). The completed document should be submitted by the student to the members of the committee. The student’s PhD Advisory Committee should be allowed at least ten days to review the document. A meeting between the student and his/her Advisory Committee will be convened at which time the student will be required to present and defend his/her document orally. The committee can ask questions of general knowledge in biomedical science as well as specific information directly related to the proposal. Students are warned that they should thoroughly understand the principals of the methods they have described in their proposal.

Immediately following the oral defense, the Advisory Committee will meet in the student’s absence to discuss the performance on the written and oral components of the Comprehensive Exam. The PhD Advisory Committee will assign a grade of Pass or Fail to each component of the exam (oral and written). When the Advisory Committee is satisfied that the student has passed the Comprehensive Examination, the PhD Comprehensive Exam Verification Form (<http://gradschool.sc.edu/forms/>) should be completed and submitted to the School of Medicine Graduate Office. This will then be filed with the USC Graduate School.

Should the student fail a component(s) of the Comprehensive Exam, a second attempt will be given for the student to successfully complete that component(s). Feedback should be provided by the committee to assist the student in preparation for the second attempt. Logistics of the second attempt at the Comprehensive Exam will be up to the discretion of the PhD Advisory Committee but may include revision of the original “mock” proposal or development of a new Comprehensive Exam. **Failure on either the written or oral component for a second time will result in dismissal from the Biomedical Science PhD program.**

## 10. PhD Dissertation Proposal

**The student should prepare and present a PhD Dissertation Proposal to their Advisory Committee by the end of the third year in the PhD program.** This proposal should be developed after thoughtful discussion with the mentor and PhD Advisory Committee. The written proposal should be submitted to members of the Advisory Committee and a meeting convened to discuss the proposed studies. The specific format of the written proposal is at the discretion of the PhD Advisory Committee; however, typically this should be a three to five page document (double-spaced) and include:

- 1) a review of the relevant literature
- 2) a statement of the problem and hypothesis that the student wishes to investigate for his/her dissertation research
- 3) an outline of the proposed aims and experimental approach(es) to be used in the dissertation research

At the committee meeting, the members of the PhD Advisory Committee will expect the student to be able to demonstrate a familiarity with the background literature for his/her research, and an understanding of the principles and applicability of the research methodology proposed. The student may present any preliminary data that he/she has obtained. The aim of this proposal is to demonstrate that he/she knows what he/she wants to do, why he/she wants to do it, and how he/she plans to carry out the work.

The committee should provide constructive suggestions to help direct the research plan. The PhD Advisory Committee will vote on whether to approve the proposal. If the committee perceives any weakness(es), it may require remedial action by the student. A *Dissertation Proposal Action Form* (form 4, see Appendix) should be completed and returned to the School of Medicine Graduate Office along with the final approved proposal.

## 11. Dissertation and Dissertation Defense

Near the beginning of the semester in which the student plans to graduate, an Application for Graduation should be completed. This form can be found on the USC Graduate School Forms Library or on the Doctoral Progress to Degree page (<http://gradschool.sc.edu/students/progress-doc.asp>).

Students in the doctoral program are required to produce a dissertation based upon original research. The dissertation is produced under the direction of the Major Professor and PhD Advisory Committee. The dissertation must be defended and approved by the PhD Advisory Committee no more than five years after completion of the Comprehensive Exam. The student's written dissertation, which is the culmination of graduate study, should make a significant contribution to the body of current knowledge in the biomedical science field. The length of the written document is up to the discretion of the Major Professor and PhD Advisory Committee. It is highly advisable for the student to publish their research findings in scientific journals prior to writing the dissertation as this will likely accelerate the assembly of the dissertation. Specific format guidelines for the written dissertation are strictly adhered to by the USC Graduate School due to the electronic submission process. These can be found on the USC Graduate School website (<http://gradschool.sc.edu/students/thesisdiss.asp?page=td>) and are the responsibility of the student.

The student will be required, as the final act before graduation, to present to the PhD Advisory Committee an oral defense of the dissertation. The candidate must give a seminar as the part of the dissertation defense. Scheduling and announcement of the seminar to the Biomedical Science Program should be coordinated through the School of Medicine Graduate Office. In

addition, the dissertation seminar announcement must be posted on the USC Graduate School website through the Graduate Management System (<http://gradschool.sc.edu/students/progress-doc.asp>). The seminar will be open to faculty and students, and questions will be invited from the audience. Following the seminar, the candidate and his/her committee will meet for additional questions; then the committee will determine if the performance is satisfactory. The dissertation defense is successful if no more than one member of the examining committee dissents. The PhD Advisory Committee members should sign the Dissertation Approval Form indicating their approval of the dissertation and its defense. This form can be found on the USC Graduate School website (<http://gradschool.sc.edu/students/progress-doc.asp>)

The successfully defended dissertation should be submitted to the USC Graduate School. The deadline for submitting the dissertation electronically is approximately 21 days before commencement. The date, subject to change by the Graduate School, is published in the master schedule each semester. It is the responsibility of the graduating student to confirm to the deadline date and schedule the defense and exit appointments accordingly.



## 1. Biomedical Science Graduate Seminar Series

**Oral presentation of research data is an important part of doctoral training. All students in the Biomedical Science PhD program are required to present their ongoing research in the Biomedical Science Graduate Seminar Series at least twice during their doctoral training.** Most students will present during their second and third years in the program. Evaluations of the student's presentation will be completed by the seminar attendees. The comments from the evaluations will be provided to the student and the student's mentor.

## 2. Annual W. Morgan Newton Symposium

This symposium was established in honor of Dr. W. Morgan Newton, the former Director of the Animal Resource Facility. **All Biomedical Science Ph.D. students are required to participate in the annual W. Morgan Newton Symposium at least once before their dissertation defense.** Students in the Biomedical Science MS program are encouraged to present but are not required to do so. Participants submit an abstract based on some aspect of their current research and make a 15-20 minute oral presentation before the faculty and students. An award committee consisting of at least one faculty member from each department selects a winner and recognizes several highly ranked presentations worthy of 'honorable mention'. Selection criteria include the following: clarity and organization of presentation; quality of research; analysis and interpretation of data; and understanding of the research demonstrated by responses to questions. The winners of the competition will receive monetary awards and a certificate. Winners of the competition will receive the highest rankings for the University-wide Graduate Student Day typically held in April.

## 3. Teaching Assistantships and Training

Biomedical Science graduates often take faculty positions at colleges, universities, and medical schools with teaching responsibilities. Therefore, training in effective scientific and medical education is beneficial. Doctoral students who enter through the Integrated Biomedical Science PhD program are required to serve as Teaching Assistants during their first year in the PhD program. Additional opportunities to participate as Teaching Assistants may exist as needed by School of Medicine Basic Science departments or other departments in the university. In addition, some graduate students in the Biomedical Science program teach science courses at Midlands Technical College. Teaching Assistant training for graduate students is offered annually through the Center of Teaching Excellence and is required for students appointed as Teaching Assistants. More information regarding these sessions can be found at the Center for Teaching Excellence website ([http://sc.edu/cte/graduate\\_students.php](http://sc.edu/cte/graduate_students.php)).

## 4. Support of Student Travel

Scientific conferences and meetings provide an important educational experience and graduate students are urged to attend and present the results of their research. To encourage student participation in scientific meetings, the program allocates a portion of its budget to support the expenses of academic travel. Requests should be made as early in the fiscal year as possible (even if the meetings are to be held or abstracts are not due until much later in the fiscal year) in order to have funds available for participation at meetings which occur late in the school's fiscal year. To apply for School of Medicine funds, students should submit an application for a USC Graduate School Travel Award (<http://gradschool.sc.edu/funding/travgrant.asp?page=faaw>). The USC Graduate School will then forward the application material to the Biomedical Sciences Graduate Director for consideration of support.

## 5. Transfer from PhD Program to the Biomedical Sciences MS Program

Under some circumstances, a student's Advisory Committee or mentor may recommend that the student transfer from the PhD program to the Master of Science (MS) program. Students may also elect to transfer from the PhD program to the MS program if their career goals change. PhD students transferring to the MS program may be required to enroll for a minimum of six (6) additional credits in the MS program.

## 6. Graduate Assistantships

In the School of Medicine, the primary means of graduate student support is the Graduate Research Assistantship. Graduate Assistantships are provided to support costs of graduate education, providing a stipend for living expenses and reduced tuition. The graduate assistant is considered a temporary employee of the University and is normally obligated to assigned responsibilities in research support in the School of Medicine. The student should interact closely with the faculty mentor to establish reasonable research schedules. During the first year, it is expected that the student will commit enough time to lab work that they can become an integral part of a research project. However, realizing that the core courses are taken during the first two semesters, the **maximum number of hours of assigned research duties required per week is twenty**. Note that this is a USC Graduate School policy. During summer or semesters without required coursework, the student is expected to devote full time to research.

Whereas the School of Medicine Graduate Office coordinates administrative processing of appointment forms at the start of each fiscal year, supervision of graduate assistants is delegated to the major professor or to an appointed advisor prior to selection of the major professor. Graduate Assistants are not normally expected to work during examination periods and school holidays. Other vacations are at the discretion of the major professor; however, students should not expect to take extended vacations when they are receiving stipend support. **It is the responsibility of the supervisor and student to discuss the period of appointment, work schedule, specific duties, manner, method, and schedule of evaluation with the Graduate Assistant.** The mentor should provide regular reviews that give feedback to the Graduate Assistant about areas of excellent performance and substandard performance which are detailed enough to make clear what results are desired.

PhD students are expected to devote full-time effort to their studies and assistantship research responsibilities. Additional employment is therefore discouraged during terms of appointment. Students must discuss with their supervisor and obtain prior approval for any additional employment to insure that it does not interfere with academic performance. Students may request assistantship appointment for less than a 12-month period if they need time off to pursue other activities. Failure to comply with these policies is grounds for termination of assistantship support.

# PhD Progression - Summary

## Year 1

- Complete Core Curriculum
- Laboratory Rotations – Submit Lab Rotation form to School of Medicine Graduate Office
- Selection of Major Professor – Submit Selection of Major Professor form to School of Medicine Graduate Office
- Complete Qualifying Exam – Submit Qualifying Exam Verification form to School of Medicine Graduate Office and to the Graduate School

## Year 2

- Select PhD Advisory Committee – Submit Committee Appointment form to School of Medicine Graduate Office and to the Graduate School
- Complete elective courses
- Submit Doctoral Program of Study form to School of Medicine Graduate Office and to the Graduate School
- Present research data in Biomedical Science Graduate Seminar series

## Year 3

- Complete any remaining elective courses
- Complete Comprehensive Examination (by end of first semester in third year) – Submit Comprehensive Exam Verification form to School of Medicine Graduate Office and to the Graduate School
- Dissertation research proposal approved by PhD Advisory Committee – Submit Dissertation Proposal Action Form to School of Medicine Graduate Office
- Present research data in Biomedical Science Graduate Seminar series
- Present in Morgan Newton Symposium

## Year 4 (and 5, if necessary)

- Complete dissertation research
- Apply for graduation – Submit online application to Graduate School
- Schedule dissertation defense – Submit Dissertation Seminar Announcement to Graduate School and to Graduate Office
- Defend dissertation research – Submit Dissertation Signature Approval form to Graduate Office and to the Graduate School

# APPENDICES



# UNIVERSITY OF SOUTH CAROLINA BIOMEDICAL SCIENCE GRADUATE PROGRAMS

## LABORATORY ROTATION FORM

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Date \_\_\_\_\_

After discussion with the laboratory mentor, I will be performing a rotation in the undersigned faculty member's laboratory.

I understand that this does not obligate the faculty mentor to accepting me into their laboratory for my PhD research. Similarly, I am not obligated to join the mentor's laboratory at the end of the rotation.

\_\_\_\_\_  
Name of Student

\_\_\_\_\_  
Signature of Student

\_\_\_\_\_  
Name of Faculty Member

\_\_\_\_\_  
Signature of Faculty Member

**Dates of the Planned Rotation:** \_\_\_\_\_  
Beginning Date

\_\_\_\_\_  
End Date

*\*\*Please submit this form electronically or hard copy to Ansley Roberts in the School of Medicine Graduate Office. Complete a new form for each rotation that you do.*



# UNIVERSITY OF SOUTH CAROLINA BIOMEDICAL SCIENCE GRADUATE PROGRAMS

## SELECTION OF MAJOR PROFESSOR FORM

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*Selection of a Major Professor is an important step in the progression towards the PhD degree. This is an agreement that should be entered into only after considerable discussion and consideration.*

*This form should be filled out by the student, signed by all involved parties and electronically or in print form to the School of Medicine Graduate Office.*

The undersigned individuals agree that \_\_\_\_\_ will carry out their  
*Student's Name*

PhD dissertation under the mentorship of \_\_\_\_\_.  
*Mentor's Name*

For PhD students, the mentor and department chair also agree to provide financial support of the student for the duration of their PhD studies.

### **Signatures:**

*Student:* \_\_\_\_\_

*Major Professor:* \_\_\_\_\_

*Department Chair:* \_\_\_\_\_

*Graduate Program Director:* \_\_\_\_\_



# UNIVERSITY OF SOUTH CAROLINA BIOMEDICAL SCIENCE GRADUATE PROGRAMS

## DISSERTATION PROPOSAL ACTION FORM

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*Each PhD candidate should prepare a written dissertation proposal that summarizes the scope of the research to be conducted and the projected content of the dissertation. Following a meeting with the student's PhD Advisory Committee, this form should be completed by the chair of the PhD Advisory Committee to document the results of the proposal meeting. The completed form and a copy of the dissertation proposal should be submitted to Ms. Ansley Roberts in the School of Medicine Graduate Office.*

Title (or focus) of Thesis/Dissertation: \_\_\_\_\_

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Date of Meeting: \_\_\_\_\_

Action Taken (Check One):

Proposal approved \_\_\_\_\_

Proposal approved conditionally\* \_\_\_\_\_

Proposal in need of re-review with another meeting \_\_\_\_\_

\* Summary of Conditions:

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*Committee Chair Name*

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*Committee Chair Signature*

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*Student Name*

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*Student Signature*

