

# Doctor of Philosophy in Cell Biology and Anatomy

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The Ph.D. program in Anatomy and Cell Biology prepares the student for a career in independent research and/or teaching. The Ph.D. is typically followed by postdoctoral training in a specific field of study. Graduates of this program have obtained positions in industry, government, and consulting, as well as faculty positions at the college, university, and medical/graduate school level.

Students that obtain a Ph.D. in Anatomy and Cell Biology are required to achieve the following expectations:

- Become knowledgeable in the areas of study included in the IGPBS (Interdisciplinary Graduate Program in the Biomedical Sciences) core curriculum.
- Obtain in-depth and up-to-date expertise in a specialized area of knowledge that is appropriate for the field of your dissertation research project.
- Make original and high quality contributions to the scientific literature in your chosen research field.
- To become familiar with the scientific literature through general and specialized journals in biological research, and to develop the ability to critically evaluate the original research in your own and related fields.
- Become skilled in organizing and communicating information in oral presentations, and to respond to critical questioning.
- Develop clarity, conciseness, and precision in writing, to aid in grant application writing, and publication of your original research results.
- Learn how to ask incisive scientific questions and gain experience in the design, performance, and interpretation of laboratory experiments and observations.
- Gain familiarity with the preparation and writing of grant applications.
- Prepare for the teaching as well as the research aspects of an academic career.
- Obtain instruction in research skills and responsible scholarship.

The application process is an online process. Application to this graduate program is facilitated through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS). (<http://catalog.ku.edu/medicine/graduate-program-biomedical-sciences>) Detailed instructions on how to apply and the application deadlines are posted on the Interdisciplinary Graduate Program in Biomedical Sciences website <http://www.kumc.edu/igpbs/how-to-apply.html>.

## Admission requirements:

- Bachelor's degree from a regionally accredited institution documented by submission of official transcript indicating the degree has been conferred before entering the program. Official transcripts from institutions attended post-baccalaureate are also required. Students with degrees from outside the U.S. may be subject to transcript evaluation indicating the degree is equivalent to a U.S. degree and meets the minimum cumulative GPA requirements.
- A cumulative grade-point average (GPA) of at least a 3.0 on a 4.0 scale for the bachelor's degree.

- Applicants who are not native speakers of English, whether domestic or international, must demonstrate they meet the Minimum English Proficiency Requirement (<http://www.kumc.edu/Documents/graduate%20studies/Min%20Engl%20Prof%2016-Oct.pdf>).
- A background check (<http://www.kumc.edu/Documents/graduate%20studies/Background%20Check%2016-Oct.pdf>) is required during the admission process; it may affect the student's eligibility to enter the program.
- An official copy of the Graduate Record Examination (GRE) score sent from Educational Testing Service (ETS) to University of Kansas Medical Center - ETS institutional code 6895.
- Three letters of recommendation.
- Prerequisite coursework:
  - One year of general chemistry
  - One year of organic chemistry or one semester of organic chemistry and one semester of biochemistry
  - One year of biological sciences
  - One semester of calculus
  - One semester of physics
- Research experience (beyond labs associated with lecture courses) is strongly suggested.
- Interview - the most qualified applicants will receive an invitation for an interview.

Applicants will be assessed based on a combination of GPA, research experience, interview and GRE scores. Students not meeting the above requirements may be eligible for provisional admission. After an applicant has been admitted, a program may defer an applicant's admission for one year after which time the applicant must submit a new application.

Admission requirements are subject to change. In most cases, use the catalog of the year student entered the program. *Other years' catalogs*.

The program consists of coursework, research experience, and the successful completion of a doctoral dissertation. Dissertation research culminates in a final dissertation examination consisting of an oral presentation by the candidate and an examination by the faculty. Relevant prior graduate work is taken into consideration in setting up individual programs of study leading to the Ph.D.

## Degree requirements:

- Degree requirements are normally completed within 5 years of admission to the program although a maximum of 8 years is allowed.
- Cumulative grade-point average (GPA) of at least a 3.0 for all KU graduate coursework.
- Successful completion of the University's Research Skills and Responsible Scholarship (<http://www.kumc.edu/Documents/graduate%20studies/Res%20Skills%20and%20Respon%20Scholar%20Doctoral%2016-Oct.pdf>) requirement prior to the semester the Oral Comprehensive Examination is scheduled.
  - Successful completion of GSMC 857 Biographics, GSMC 852 Introduction to Biomedical Research I and GSMC 855 Introduction to Biomedical Research II (or equivalent) meets the Research Skills requirement.
  - Successful completion of GSMC 856 Introduction to Research Ethics (or equivalent) meets the Responsible Scholarship requirement.
- Successful completion of the Residence Requirement ([http://www.kumc.edu/Documents/graduate%20studies/Residence%20Requirement%20PhD%2016-Oct\(0\).pdf](http://www.kumc.edu/Documents/graduate%20studies/Residence%20Requirement%20PhD%2016-Oct(0).pdf)) prior to the semester the

Oral Comprehensive Examination is scheduled. The requirement is met by enrollment in full-time status a minimum of two semesters.

- Successful completion of the Oral Comprehensive Examination (<http://www.kumc.edu/Documents/graduate%20studies/Comprehensive%20Oral%20Exam%20PhD%2016-Oct.pdf>). Students are recognized as formal doctoral candidates after they have passed the comprehensive examination.
- Successful completion of the Post-Comprehensive Enrollment (<http://www.kumc.edu/Documents/graduate%20studies/Post-Comp%20Enrollment%20PhD%2016-Oct.pdf>) requirement.
- Enrollment in a minimum of one (1) credit hour of ANAT 999 Doctoral Dissertation the semester the student will defend dissertation and graduate.
- Successful completion of the Final Oral Examination (<http://www.kumc.edu/Documents/graduate%20studies/Final%20Oral%20Exam%20PhD%2016-Oct.pdf>) (dissertation defense.)
- Successful Dissertation Submission and Publication (<http://www.kumc.edu/Documents/graduate%20studies/Dissertation%20Submit%20and%20Pub%2016-Oct.pdf>) (according to Office of Graduate Studies policy.)
- Successful completion of the following Interdisciplinary Graduate Program in Biomedical Science (IGPBS) (<http://catalog.ku.edu/medicine/graduate-program-biomedical-sciences>) courses (or their equivalent):

GSMC 850	Proteins and Metabolism	2
GSMC 851	Molecular Genetics	2
GSMC 852	Introduction to Biomedical Research I	2
GSMC 853	Cellular Structure	2
GSMC 854	Cell Communication	2
GSMC 855	Introduction to Biomedical Research II	2
GSMC 856	Introduction to Research Ethics	1
GSMC 857	Biographics	1
GSMC 858	Introduction to Faculty Research	1
GSMC 859	Research Rotations	1-4

- Successful completion of the following Anatomy and Cell Biology courses:

ANAT 845	Graduate Histology	3
ANAT 885	Seminar	1
ANAT 890	Graduate Research	1-10
ANAT 900	Analysis of Scientific Papers	1
ANAT 990	Doctoral Research	1-12
ANAT 999	Doctoral Dissertation	1-12

- Students must be continually enrolled in ANAT 885 Seminar and ANAT 900 Analysis of Scientific Papers each fall and spring semester beginning with fall semester of their second year. These two courses may be waived for one semester after the student has completed all departmental requirements other than the dissertation defense.
- Successful completion of a minimum of two (2) credit hours of elective coursework related to specialized interests. Electives are chosen in consultation with the student's advisor. Electives may be chosen from this list or students may select electives from courses offered by other departments.

ANAT 846	Advanced Neuroscience	5
ANAT 847	Developmental Neurobiology	2

ANAT 848	Molecular Mechanisms of Neurological Disorders	3
ANAT 868	Advanced Developmental Biology	2
ANAT 869	Grant Writing	3
ANAT 870	Research Methods and Advanced Technologies in Biomedical Research	1-3
ANAT 880	Advanced Topics: _____	1-5

- Successful completion of two hour-long presentations in the regular departmental seminar series (or an equivalent seminar approved by the graduate education director) are to be given in two separate semesters, not including the one in which the student defends.
- Gain teaching experience by assisting in selected courses that are chosen in consultation with the student's advisor and the graduate education director.

Students enrolled in the MD-PhD Physician Scientist Training Program should review the Degree Requirements (<http://catalog.ku.edu/medicine/combined-md-phd/#degreerequirementstext>) section of this catalog for that program.

Degree requirements and course descriptions are subject to change. Any courses taken as an equivalent must be approved by the Graduate Director and the Office of Graduate Studies. In most cases, use the catalog of the year student entered the program. *Other years' catalogs*.

## Typical Plan of Study

### Year 1

Fall	Hours Spring	Hours Summer	Hours
GSMC 850	2 GSMC 853	2 GSMC 859	1-4
GSMC 851	2 GSMC 854	2 May take an elective course from the student's chosen degree program in consultation with the student's advisor.	1-3
GSMC 852	2 GSMC 855	2	
GSMC 856	1 GSMC 859	1-4	
GSMC 857	1		
GSMC 858	1		
GSMC 859	1-4		
10-13		7-10	2-7

Total Hours: 19-30

Year 2			
Fall	Hours Spring	Hours Summer	Hours
ANAT 885	1 ANAT 845	3 ANAT 890	1-6
ANAT 890	1-6 ANAT 885	1 Oral Comprehensive Exam may be scheduled as early as this semester if approved by committee to proceed.	
ANAT 900	1 ANAT 890	1-6	
Form and schedule first meeting with Research Advisory Committee.	ANAT 900	1	
	3-8	6-11	1-6

Year 3			
Fall	Hours Spring	Hours Summer	Hours
ANAT 885	1 ANAT 885	1 ANAT 990	1-6
ANAT 890	1-6 ANAT 900	1	
ANAT 900	1 ANAT 990	1-6	
Oral Comprehensive Exam must be completed by December 31.	First hour-long seminar presented.		
	3-8	3-8	1-6

Year 4			
Fall	Hours Spring	Hours Summer	Hours
ANAT 885	1 ANAT 885	1 ANAT 990	1
ANAT 900	1 ANAT 900	1	
ANAT 990	1-6 ANAT 990	1-6	
18 hour postcomp enrollment completed Summer Year 3 if Oral Comp passed Summer Year 2 - begin reduced enrollment Fall Year 4.	Second hour-long seminar presented.		
	3-8	3-8	1

Year 5			
Fall	Hours Spring	Hours Summer	Hours
ANAT 885	1 ANAT 885	1 ANAT 999	1
ANAT 900	1 ANAT 900	1	
ANAT 999	1 ANAT 999	1	

Final Oral Exam (dissertation defense) may be scheduled as early as this semester if approved by committee to defend and graduate.			
ANAT 885 and ANAT 900 may be waived for one semester after the student has completed all departmental requirements other than the dissertation defense.			
	3	3	1
Total Hours: 31-71			

A Ph.D. in Anatomy and Cell Biology signifies that the holder is prepared for entry into a career in independent research and/or teaching. Therefore, graduates must have the knowledge and skills to function in a broad variety of classroom and/or laboratory situations. In this manner, all students admitted into the Anatomy and Cell Biology Ph.D. program must meet the following abilities and expectations:

- 1. Observation:** The candidate must be able to observe demonstrations and experiences in the basic sciences, including, but not limited to, biology demonstrations in animals, cultures, and microscopic studies of tissues in normal and pathologic states. A candidate must be able to observe and analyze experimental detail. Observation necessitates the functional use of the senses of vision and touch.
- 2. Communication:** A candidate should be able to communicate, to understand, and to observe lectures and laboratory instruction. A candidate must be able to communicate effectively in order to present and analyze research data. Communication includes not only speech, but also reading and writing. The candidate must be able to communicate effectively and efficiently in oral and written form with students, staff, and faculty.
- 3. Motor:** Candidates should have sufficient motor function to carry out lab techniques. A candidate should be physically able to do laboratory procedures and analyze data. Such actions require coordination of both gross and fine muscular movements, equilibrium, and functional use of the senses of touch and vision.
- 4. Intellectual-Conceptual, Integrative, and Quantitative Abilities:** These abilities include measurement, calculation, reasoning, analysis, and synthesis. Problem solving, the critical skill demanded of scientists, requires all of these intellectual abilities. In addition, the candidate should be able to comprehend three-dimensional relationships and to understand the spatial relationships of structures.
- 5. Behavioral and Social Attributes:** A candidate must possess the emotional health required for full utilization of his/her intellectual abilities, the exercise of good judgment, and the prompt completion of all responsibilities attendant to the completion of research and

teaching responsibilities. Integrity and motivation are personal qualities, which are required for success in science.