

Doctor of Philosophy in Biochemistry and Molecular Biology

The Ph.D. is required for careers in independent research in biochemistry and molecular biology. The Ph.D. most often is followed by one or more years of postdoctoral training in a specific area of research. Ph.D. degree holders in biochemistry and molecular biology may find positions in industry or government and, with some postdoctoral experience, may obtain faculty positions at the college or university level.

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 - **GRE Scores NOT APPLICABLE TO THE IGPBS.**
- 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, and interview. 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 5-6 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>). This will comprise (i) a written grant proposal that conforms to the NIH R01 guidelines; and (ii) and oral examination that centers around material in the written proposal, as well as broader aspects of biochemistry and molecular biology. The topic may be broadly related to the student's research area, but hypotheses should be developed independently by the student. Students are expected to complete the Oral Comprehensive Exam by the end of year 2. Students are recognized as formal doctoral candidates after they have passed the comprehensive examination.
- Successful completion of 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 BCHM 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):

Code	Title	Hours
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

- As determined in consultation with the student's advisor, students who have not previously mastered undergraduate biochemistry will strengthen any areas of weakness by taking BCHM 850 Topics in Biochemistry.
- Successful completion of the following Biochemistry core courses:

Code	Title	Hours
BCHM 802	Biochemistry Seminar	1
BCHM 808	Methods for Analyzing Biomolecules	3
BCHM 862	Biochemical Research-Literature Seminar	1
BCHM 890	Research in Biochemistry	1-15
BCHM 922	Advanced Molecular Genetics	3
BCHM 923	Protein Structure and Function	3
BCHM 990	Doctoral Research	1-15
BCHM 999	Doctoral Dissertation	1-15

- Successful completion of additional elective coursework as determined in consultation with the student's advisor. These electives may be substituted for a required course on a case-by-case basis. Suggested elective courses include:

Code	Title	Hours
BCHM 850	Topics in Biochemistry	1-3
ANAT 868	Advanced Developmental Biology	2
PATH 803	Stem Cell Biology	2

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
BCHM 850 (if required by advisor)	1-3 BCHM 808 (or take Spring Year 3)	3 BCHM 990	1-6
BCHM 862	1 BCHM 862	1 Optional electives	1-6
BCHM 890	1-6 BCHM 890	1-6	
BCHM 922 (or take Fall Year 3)	3 BCHM 923 (or take Spring Year 3)	3	
Optional electives	Optional electives	1-6	
	Oral Comprehensive Exam is expected to be scheduled at the end of this semester.		
	6-13	9-19	2-12

Year 3

Fall	Hours Spring	Hours Summer	Hours
BCHM 862	1 BCHM 802	1 BCHM 990	1-6
BCHM 922 (if not taken Fall Year 2)	3 BCHM 808 (if not taken Spring Year 2)	3 Optional electives	1-6
BCHM 990	1-6 BCHM 923 (if not taken Spring Year 2)	3	
Optional electives	1-6 BCHM 990	1-6	

	Optional electives	1-6	
	6-16	9-19	2-12
Year 4			
Fall	Hours Spring	Hours Summer	Hours
BCHM 862	1 BCHM 862	1 BCHM 990	1-6
BCHM 990	1-6 BCHM 990	1-6 Optional electives	1-6
Optional electives	1-6 Optional electives	1-6	
	3-13	3-13	2-12
Year 5			
Fall	Hours Spring	Hours Summer	Hours
BCHM 862	1 BCHM 862	1 BCHM 990 or 999 (if preparing to defend dissertation)	1
BCHM 990	1 BCHM 990 or 999 (if preparing to defend dissertation)	1	
	Final Oral Exam (dissertation defense) scheduled in year 5 or 6 the semester approved by committee to defend and graduate.		
	2	2	1
Year 6			
Fall	Hours Spring	Hours Summer	Hours
BCHM 862	1 BCHM 999	1 BCHM 999	1
BCHM 999	1		
	2	1	1

Total Hours 51-138

TECHNICAL STANDARDS AND REQUIREMENTS FOR GRADUATE STUDIES IN THE DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

The Ph.D. degree signifies that the holder is prepared for entry into research and/or teaching in postgraduate training and faculty positions. To that end, graduates must have the knowledge and skills to function in a broad variety of academic situations in the classroom and laboratory.

Therefore all students admitted for graduate study in Biochemistry and Molecular Biology 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 sense of vision and somatic sensation.
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 perform 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.

Disabled individuals are encouraged to apply. Applicants whose response indicates that they cannot meet the expectations will be reviewed by the Graduate Committee and Technical Support staff of KUMC to assess the extent of the student's difficulties. At this review, the provisions for reasonable accommodation will be determined.

For further information, contact The Department of Biochemistry and Molecular Biology, University of Kansas School of Medicine, MSN 3030, 3901 Rainbow Blvd., Kansas City, Kansas 66160 (Phone: (913) 588-7005 Fax: (913) 588-9896 E-mail: lswint-kruse@kumc.edu

STUDENT POLICY ON INFECTIOUS DISEASE

Due to the need to assure the health and safety of students, faculty, and staff, the fact that an applicant for admission has an infectious disease or is the carrier of an infectious disease may be a factor in determining eligibility for admission to academic programs at the University of Kansas Medical Center. In such cases, the determination of eligibility for admission will be made on an individual basis in consultation with the applicant's physician; the decision will take a number of factors into consideration, including the legal requirements and the current best medical information available to determine whether the applicant could complete the normal course of study with reasonable accommodation and without risk to him/herself or to others. Therefore, applicants having an infectious disease or who are carriers of an infectious disease must advise the Graduate Committee of this fact and may be required to provide medical records for review by the Student Health Physician in order to determine eligibility for admission.

DRUG FREE WORKPLACE POLICY OF THE UNIVERSITY OF KANSAS

It is the policy of the University of Kansas that unlawful manufacture, distribution, dispensing, possession, or use of controlled substances or alcohol is prohibited in buildings, facilities, or grounds controlled by the University. Any student found to be illegally manufacturing, distributing, dispensing, possessing, or using controlled substances or alcohol at the University or any of its affiliated educational sites, shall be subject to disciplinary action in accordance with applicable policies as outlined in the Graduate Student Handbook. Students are reminded that illegal

manufacture, distribution, dispensing, possession, or use of controlled substances may also subject individuals to criminal prosecution.