

# BIOCHEMISTRY, PHD

Email Program Coordinator

**Degree:** Doctor of Philosophy (PhD)

**Field of Study:** Biochemistry

## Program Overview

The PhD in Biochemistry program prepares students for careers in biochemistry. The goal of the program is to help students become professional scientists. The emphasis of the doctoral program is on research, culminating in the completion of an original independent doctoral thesis under the guidance of a faculty member in the biochemistry program. Students' research is aimed at understanding the structures and functions of proteins and other biological macromolecules, such as RNA in biological systems. There is also a strong focus on understanding the molecular mechanisms of complex diseases, such as cancer and infectious diseases, that can lead to new therapies. Most research projects involve collaborations with scientists at CWRU and at institutions around the world.

Students begin with an integrated curriculum in cell and molecular biology and then take courses in Biochemistry and other subjects to provide the knowledge base they need as scientists. They also participate in formal and informal seminars as well as discussions of current literature.

## Admissions

Students are admitted to this PhD program through the Biomedical Sciences Training Program (BSTP) or the Medical Scientist Training Program (MSTP).

### Biomedical Sciences Training Program (BSTP)

The BSTP offers a common entry point to most of the School of Medicine's biomedical PhD programs. BSTP students can choose among research mentors in many different PhD programs in the School of Medicine.

### Medical Scientist Training Program (MSTP)

Students in the MSTP earn the dual MD/PhD degree. MSTP students also have the choice of mentors in many different PhD programs. The admission requirements of those programs can be viewed on their pages in the Bulletin. Program requirements for the dual can be found on the Medical Scientist Training Program, PhD/Medicine, MD program page.

## PhD Policies

For PhD policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

## Program Requirements

Students enter the program through the Biomedical Sciences Training Program (BSTP) or the Medical Scientist Training Program (MSTP). Students perform research rotations with faculty members while they are in those programs and then select a faculty research advisor and join the

Biochemistry PhD program after the first semester (BSTP) or second year (MSTP).

The Biochemistry PhD requires coursework, a qualifying exam, and completion of the thesis. Throughout the doctoral training, students participate in seminars, journal clubs, and research meetings with their lab group and the Biochemistry Department.

## Coursework

Coursework taken while students are in the BSTP or MSTP provide a solid basis of fundamental knowledge. Once students join the Biochemistry PhD program, they take courses in Biochemistry and other departments that provide them with a comprehensive understanding of biochemistry and other subjects, with a focus on acquiring the knowledge required to complete the thesis research as described in the Program of Study. Students who have completed relevant coursework elsewhere, (for example, with an MS) may petition to complete alternative courses. The PhD degree requires 36 hours of coursework (24 hours of which are graded).

## Qualifying Exam

Each PhD student must complete a qualifying examination on their research topic in the form of a grant proposal with oral defense on their thesis topic for advancement to candidacy. The qualifying examination is usually completed during the second year.

## Thesis

The thesis research is the most important element of the degree. Students complete an independent body of research with mentoring from their thesis advisor, and extensive interactions with faculty members, students, and other researchers. Publication of results in scientific journals is a degree requirement. During the dissertation period, students meet regularly with their thesis committees, present seminars in the department, attend scientific meetings, and fulfill journal publication requirements. During the thesis research, students complete 18 hours of BIOC 701.

## Sample Plan of Study

First Year		Hours
Fall		
IBMS 450	Fundamental Biostatistics to Enhance Research Rigor & Reproducibility	1
IBMS 453	Cell Biology I	3
IBMS 455	Molecular Biology I	3
Select one of the following:		1
IBMS 456A	Since You Were Born: Nobel Prize Biomedical Research in the Last 21 Years- Section A	
IBMS 456B	Since You Were Born: Nobel Prize Biomedical Research in the Last 21 Years- Section B	
IBMS 456C	Since You Were Born: Nobel Prize Biomedical Research in the Last 21 Years- Section C	
IBMS 456D	Since You Were Born: Nobel Prize Biomedical Research in the Last 21 Years- Section D	
Select one of the following:		1
BIOC 601	Biochemical Research	

BSTP 400	Research Rotation in Biomedical Sciences Training Program	
MSTP 400	Research Rotation in Medical Scientist Training Program	
<b>Hours</b>		<b>9</b>
<b>Spring</b>		
BIOC 434	Structural Biology	3
BIOC Elective		3
BIOC 601	Biochemical Research	2
IBMS 500	On Being a Professional Scientist: The Responsible Conduct of Research	1
<b>Hours</b>		<b>9</b>
<b>Second Year</b>		
<b>Fall</b>		
BIOC 611	Biochemistry Seminar I	1
BIOC Elective		3
BIOC 601 or BIOC 701	Biochemical Research <sup>a</sup> or Dissertation Ph.D.	5
<b>Hours</b>		<b>9</b>
<b>Spring</b>		
BIOC 612	Biochemistry Seminar II	1
BIOC Elective		3
BIOC 701	Dissertation Ph.D.	3
BIOC 641	Proposition I	2
<b>Hours</b>		<b>9</b>
<b>Third Year</b>		
<b>Fall</b>		
BIOC 701	Dissertation Ph.D.	4
<b>Hours</b>		<b>4</b>
<b>Spring</b>		
BIOC Elective		3
BIOC 701	Dissertation Ph.D.	3
<b>Hours</b>		<b>6</b>
<b>Fourth Year</b>		
<b>Fall</b>		
BIOC 701	Dissertation Ph.D.	2
<b>Hours</b>		<b>2</b>
<b>Spring</b>		
BIOC 701	Dissertation Ph.D.	2
<b>Hours</b>		<b>2</b>
<b>Fifth Year</b>		
<b>Fall</b>		
BIOC 701	Dissertation Ph.D.	2
<b>Hours</b>		<b>2</b>
<b>Spring</b>		
BIOC 701	Dissertation Ph.D.	2
IBMS 501	Responsible Conduct of Research for Advanced Trainees <sup>b</sup>	0
<b>Hours</b>		<b>2</b>
<b>Total Hours</b>		<b>54</b>

b IBMS 501 is offered every spring semester. The SOM requires that PhD students who are 4 years beyond their initial RCR training in IBMS 500, register for IBMS 501.

## Dual Degree Options

- Medical Scientist Training Program (MSTP), PhD/Medicine, MD

a BIOC 601 for pre-candidacy, BIOC 701 for post-candidate.