PHARMACOLOGY AND TOXICOLOGY, DOCTOR OF PHILOSOPHY (PH.D.)

Program goal

The Ph.D. program is designed to provide students with the skills required to advance to positions as bioscience researchers and trainers in a broad spectrum of positions. The structure of the program provides a framework for the progressive development of a mastery of the current state of the subject matter of bioscience, an ability to synthesize this information and apply this foundation to the identification of key areas of investigation and experimentation in bioscience. The program relates this framework to the development of the ability to design, implement and interpret experimental approaches that address the questions identified. In addition, the program will develop skills in the various means of communicating both the core of bioscience knowledge and the expression of experimental design, results and interpretation to a variety of potential audiences.

Student learning outcomes

SLO 1.0: Communication skills

The candidate will demonstrate the achievement of an appropriate level of oral communication skills with respect to the content, organization, logical flow, presentation and appropriate use of language incorporating the use of visual aids, as measured by rubric.

- Measure 1.0: Dissertation review and examination
- Measure 2.0: Oral doctoral candidacy examination
- Measure 3.0: Performance review of progress
- Measure 4.0: Written doctoral candidacy examination

SLO 2.0: Experimental skills

The candidate will demonstrate the achievement of an appropriate level of competence in the ability to appraise, modify and/or create, and implement experimental protocols and to design and develop experiments as measured by rubric.

- Measure 1.0: Dissertation review and examination
- Measure 2.0: Oral doctoral candidacy examination
- Measure 3.0: Performance review of progress
- Measure 4.0: Written doctoral candidacy examination

SLO 3.0: Integrated knowledge of biosciences

The candidate will demonstrate an appropriate level of knowledge of the current elements of the biosciences as related to disciplinary specialization and a more detailed understanding of the individual area of scholarship, including an appropriate familiarity with the research literature and the ability to evaluate and critique publications as measured by the rubric.

- Measure 1.0: Dissertation review and examination
- Measure 2.0: Oral doctoral candidacy examination
- Measure 3.0: Performance review of progress
- Measure 4.0: Written doctoral candidacy examination

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the Graduate School website (http://www.graduate.vcu.edu/) and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the academic regulations section for additional information on academic regulations for graduate students. **(**http://bulletin.vcu.edu/academic-regs/**)**

Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the academic regulations section for additional information on degree candidacy requirements. **(**http://bulletin.vcu.edu/academic-regs/grad/candidacy/**)**

Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the academic regulations section for additional information on graduation requirements. **(**http://bulletin.vcu.edu/academic-regs/grad/graduation-info/**)**

Other information

Students wishing to matriculate into the Department of Pharmacology and Toxicology can contact the program director for further advice on course requirements and advising.

School of Medicine graduate program policies

The School of Medicine provides policies applicable to all programs administratively housed in the school. Information on **doctoral programs** is available elsewhere in this chapter of the Graduate Bulletin.

Apply online today. (https://www.vcu.edu/admissions/apply/graduate/)

Admission requirements

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
Ph.D.	Fall	Applications received prior to Jan 15 given priority consideration	TOEFL (individuals for whom English is a second language)

Special requirements

- Applications for the program must be submitted to the Biomedical Sciences Doctoral Portal – School of Medicine – Ph.D. selected from the drop-down menu of programs on the VCU online application form.

In addition to the general admission requirements of the VCU Graduate School (http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/), successful applicants will typically have the following credentials:

1. A baccalaureate degree or its equivalent at the time of enrollment, with an undergraduate GPA of 3.5
2. TOEFL scores of 600 (pBT), 250 (cBT) or 100 (iBT) for individuals for whom English is a second language; or 6.5 on the IELTS (To report TOEFL score, use VCU Code 5570.)
3. Personal statements, which should include: long-term career goals to assess reasons behind the candidate's application; how a Ph.D. in biomedical science helps achieve those goals; the factors motivating a career in research; research experience, including dates, places and duration
4. Three letters of recommendation that speak to the scientific competency and experience of the applicant
5. The equivalent of two semesters of general chemistry, two semesters of organic chemistry and two semesters of upper-level biology courses (e.g. cell biology, molecular biology, biochemistry, genetics, neuroscience, physiology, biophysics, etc.)

Degree requirements

The broad base offered in the PhD. program in pharmacology and toxicology, together with basic training in physiology and biochemistry, provides the background for a successful career in academic institutions, industry or government. The research program of the department is sufficiently broad to provide an adequate basis for entry into a wide variety of interesting areas of modern biology and medicine.

In addition to the general VCU Graduate School graduation requirements (http://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students must complete a minimum of 60 graduate credit hours. With few exceptions, Ph.D. students are enrolled in the Biomedical Sciences Doctoral Portal from matriculation until matched with an adviser, usually by the summer semester of the second year. The students are moved into the Ph.D. in Pharmacology and Toxicology major after meeting program requirements. Students customarily complete formal course work in pharmacology and biochemistry during the first year of study. Participation in research also is begun early in the first year. Students interested or committed to pharmacology should take the footnoted ([1]) courses listed in the curriculum requirements section during the portal period to assure rapid progress toward the degree.

In the third and subsequent years, the majority of the course load is taken as PHTX 697. Advanced electives also may be taken as desired and with the approval of the adviser. Students and faculty participate in a seminar program (PHTX 690) that includes distinguished visiting scientists from the U.S. and abroad. Following completion of a qualifying examination, a degree candidate is required to submit and defend a thesis embracing an original research project conducted under the guidance and supervision of an adviser and an advisory committee. There is no foreign language requirement. The average time necessary to complete the doctoral program in pharmacology and toxicology is four to five years.

Course requirements

Course	Title	Hours
Required core courses		
BIOC 503	Biochemistry, Cell and Molecular Biology [1]	5
BIOC 661	Critical Thinking	1
IBMS 600	Laboratory Safety [1]	1
IBMS 620	Laboratory/Clinical Rotations (two-credit course taken for three rotations) [1]	6
PHTX 630	Basic Concepts in Pharmacology for Graduate Students [1]	3
PHTX 636	Principles of Pharmacology	5
PHTX 639	Principles of Pharmacology Journal Club	1
Required additional courses		
OVPR 601	Scientific Integrity	1
or OVPR 602	Responsible Scientific Conduct	
or OVPR 603	Responsible Conduct of Research	
PHTX 690	Pharmacology Research Seminar [2]	1
or IBMS 690	Basic Health Sciences Research Seminar	
Elective courses		**6**
ANAT 610	Systems Neuroscience	
BIOC 504	Biochemistry, Cell and Molecular Biology	
BIOC 601	Membranes and Lipids	
BIOC 605	Molecular Biology	
BIOS 543	Graduate Research Methods I	
BIOS 544	Graduate Research Methods II	
CHEM 504	Advanced Organic Chemistry I	
EGRB 603	Biomedical Signal Processing	
EGRB 610	Microprocessor Interfacing for Biomedical Instrumentation	
IBMS 635	Cellular Signalling	
MEDC 541	Survey of Molecular Modeling Methods	
MEDC 601	Advanced Medicinal Chemistry I	
MEDC 630	Theoretical Methods in Drug Design	
MICR 505	Immunobiology	
MICR/BNFO 653	Advanced Molecular Genetics: Bioinformatics	
NEUS 609	Cellular and Molecular Neuroscience	

PHIS 501	Mammalian Physiology	
PHIS 604	Cell Physiology: Cardiovascular and Respiratory	
PHIS 615	Signal Detection in Sensory Systems	
PHIS 620	Ion Channels in Membranes	
PHTX 632	Neurochemical Pharmacology	
PHTX 633	Behavioral Pharmacology	
PHTX/FRSC 644	Forensic Toxicology	
Dissertation research		
PHTX 697	Directed Research in Pharmacology	30
Total Hours		60

[1]

Students interested in or committed to pharmacology should take these courses during the portal year to assure rapid progress toward the degree.

[2]

Students are expected to enroll in PHTX 690 Pharmacology Seminar each semester (will accumulate more than 1.0 credit during academic years). Doctoral students are required to present a dissertation seminar prior to the final committee defense as a requirement for completion of the degree.

The minimum number of graduate credit hours required for this degree is 60.

Typical plan of study

Many students often end up taking more than the minimum number of hours required for a degree program. The total number of hours may vary depending upon the program, nature of research being conducted by a study or in the enrollment or funding status of the student. Students should refer to their program websites and talk with their graduate program directors or advisers for information about typical plans of study and registration requirements.

M.D.-Ph.D. opportunity

The M.D.-Ph.D. program allows students to pursue both the M.D. and Ph.D. degrees using a coordinated program of study and apply a limited number of M.D. requirements toward fulfillment of requirements for the Ph.D. See the dual degree program page (http://bulletin.vcu.edu/graduate/dual-degree-opps/md-pharmtox-phd/) for additional details.

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Program website: pharmtox.vcu.edu (https://pharmtox.vcu.edu/)