



Program Structure and Specification
Doctor of Philosophy Program in Biochemistry
 (International Program)
 Curriculum Last Revised in 2023
 for
Students Entering in Academic Year 2024

- 1. Program Title** Doctor of Philosophy Program in Biochemistry (International Program)

- 2. Name of Degree**
 - Full name : Doctor of Philosophy (Biochemistry)
 - Abbreviation : Ph.D. (Biochemistry)

- 3. Responsible Units**
 - 3.1 Department of Biochemistry, Faculty of Science, Mahidol University
 - 3.2 Faculty of Graduate Studies, Mahidol University

- 4. Philosophy and Expected Learning Outcomes of the Program**
 - 4.1 Philosophy of the Program:**

The program is designed to produce Ph.D. graduates with comprehensive knowledge and research skills in biochemistry and molecular biology, good research ethics, and ability to produce internationally accepted research work and create new knowledge for the betterment of society.
 - 4.2 Program Learning Outcomes:**

Program Learning Outcomes are formulated according to the recommended “Standard for Doctoral Degrees in the Molecular Biosciences” published by International Union of Biochemistry and Molecular Biology in 2011 as following:
Upon completion of the doctoral program, graduates must be able to:

 - 4.2.1 Demonstrate proper ethical conduct for the scientific professions, including conduct for research
 - 4.2.2 Translate frontier knowledge in biochemistry to the scientific community as well as to the public
 - 4.2.3 Independently operate international-standard laboratory experiments in biochemistry
 - 4.2.4 Analyze scientific questions and research findings using theoretical framework and principles in biochemistry to come up with rational explanation or discussion
 - 4.2.5 Critically evaluate scientific merit of up-to-date biochemistry knowledge and literature, and thoroughly formulate a novel research proposal with scientifically-sound experimental design to create new knowledge or concepts in biochemistry
 - 4.2.6 Effectively work independently or as part of a team

- 4.2.7 Demonstrate effective uses of numerical and data analytical skills, communication skills and information technology

5. Admission Requirements

Plan 1: Research only

Plan 1.1: For students with a Master's degree

1. Applicants must hold a Master's degree in biochemistry, molecular biology, biology, chemistry, biological sciences, health sciences or related fields from institutions accredited by the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation.
2. Applicants must have a cumulative GPA of at least 3.50 on a 4-point scale.
3. Applicants must have at least one publication in an international peer-reviewed journal listed in Scopus database.
4. Applicants must meet the minimum English proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
5. Applicants whose qualifications differ from item 2) and item 4) may apply with approval from the Program Committee and the Dean of Faculty of Graduate Studies.

Plan 2: Coursework and research

Plan 2.1: For students with a Master's degree

1. Applicants must hold a Master's degree in biochemistry, molecular biology, biology, chemistry, biological sciences, health sciences or related fields from institutions accredited by the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation.
2. Applicants must have a cumulative GPA of at least 3.50 on a 4-point scale.
3. Applicants must meet the minimum English proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
4. Applicants whose qualifications differ from items 2) and 3) may apply with approval from the Program Committee and the Dean of Faculty of Graduate Studies.

Plan 2.2: For students with a Bachelor's degree

1. Applicants must hold a Bachelor's degree in any area of science, pharmaceutical science, medicine, dentistry, veterinary medicine or other health sciences from institutions accredited by the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation.
2. Applicants must have a cumulative GPA of at least 3.50 on a 4-point scale.
3. Applicants must meet the minimum English proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
4. Applicants whose qualifications differ from items 2) and 3) may apply with approval from the Program Committee and the Dean of Faculty of Graduate Studies.

6. Selection Method

Applicants are selected based on academic/research credentials and interview. International applicants may be subjected to phone/online interview and must provide proof of financial support during the study period to be considered for admission. Final judgment will be made under the consideration of the Administrative Program Committee in concurrence with the Dean of Faculty of Graduate Studies, Mahidol University.

7. Academic System

7.1 Semester system

Two semester credit system

7.2 Credit Assignment

The number of credits assigned to each subject is determined as follows:

- 7.2.1 Lecture or discussion consuming 15 hours per semester is equal to 1 credit hour.
- 7.2.2 Laboratory or practice consuming 30 hours per semester is equal to 1 credit hour.
- 7.2.3 Thesis consuming 45 hours per semester is equal to 1 credit hour.

8. Language

English is used in teaching and learning as well as in the assessment processes.

9. Registration

- 9.1 Students must register as full time students.
- 9.2 Students must register for no less than 9 credits and no more than 15 credits per regular semester, or according to program study plan.

10. Evaluation and Graduation Requirements

10.1 Evaluation

Student evaluation is in accordance with the rules and regulations of Mahidol University. (See details at <http://www.grad.mahidol.ac.th>)

10.2 Graduation Requirements

Plan 1: Research only

1. Total time of study should not exceed the study plan.
2. Student must complete 48 dissertation credits, but may register for other non-credit courses with approval from academic advisor and/or the Program Committee.
3. Student must meet the graduation English proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
4. Student must pass the qualifying examination.
5. Student must complete the Essential Skills Development Activities for Graduate Students organized by the Faculty of Graduate Studies, Mahidol University.
6. Student must pass the dissertation defense examination according to Regulations of the Faculty of Graduate Studies, Mahidol University. The dissertation examination must be open to a general audience. The final version of the dissertation must then be submitted to the Faculty of Graduate Studies, Mahidol University.
7. The student's dissertation, in part or in whole, must be published or accepted for publication as at least two original research articles, according to the Announcement of Ministry of Education on Standard Criteria of Graduate Studies and the Announcement of the Faculty of Graduate Studies, Mahidol University on Regulations of Dissertation Publishing for Graduation. At least one of the articles must be in an international peer-reviewed journal. The candidate must be the first author of both publications.

Plan 2: Coursework and research

1. Total time of study should not exceed the study plan.
2. Student must complete minimum credits as follows:
 - (1) Students with Bachelor's degree must complete at least 72 credits, comprising 24 course credits and 48 dissertation credits, with a cumulative GPA not less than 3.50.
 - (2) Students with Master's degree must complete at least 48 credits, comprising 12 course credits and 36 dissertation credits, with a cumulative GPA not less than 3.50.
3. Student must pass the qualifying examination.

4. Student must meet the graduation English proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
5. Student must complete the Essential Skills Development Activities for Graduate Students organized by the Faculty of Graduate Studies, Mahidol University.
6. Student must pass the dissertation defense examination according to Regulations of the Faculty of Graduate Studies, Mahidol University. The dissertation examination must be an open to a general audience. The final version of the dissertation must then be submitted to the Faculty of Graduate Studies, Mahidol University.
7. The student's dissertation, in whole or in part, must be published or accepted for publication in an international peer-reviewed journal according to the Announcement of Ministry of Education on Standard Criteria of Graduate Studies and the Announcement of the Faculty of Graduate Studies, Mahidol University on Regulations of Dissertation Publishing for Graduation. The candidate must be the first author or a corresponding author.

11. Library

Our Stang Mongkolsuk Library possesses more than 10,000 books. Many journals can be accessed online. Besides, a lot of text books and journals (in both electronic and printed formats) are available at other libraries within Mahidol University.

12. Program Structure

12.1 The number of credits required for the program

- 12.1.1 Number of credits required for the program is no less than 72 credits (for students from B.Sc.)
- 12.1.2 Number of credits required for the program is no less than 48 credits (for students from M.Sc.)

12.2 Curriculum Structure

The curriculum structure is set in compliance with the Announcement of Ministry of Education on the subject of the Graduate Program Standard Criteria B.E. 2558, Doctor of Philosophy Degree, Plan 1 and 2 as follows:

Plan 1: Research-only

Plan 1.1: For students with a Master's degree

1) Required courses	none
2) Elective courses not less than	none
3) Dissertation	48 credits
Total not less than	48 credits

Plan 2: Coursework and research

Plan 2.1: For students with a Master's degree

1) Required courses	9 credits
2) Elective courses not less than	3 credits
3) Dissertation	36 credits
Total not less than	48 credits

Plan 2.2: For students with a Bachelor's degree

1) Required courses	13 credits
2) Elective courses not less than	11 credits
3) Dissertation	48 credits
Total not less than	72 credits

12.3 Course Requirements

12.3.1 Required Courses

Credits (lecture-lab-self study)

For students from B.Sc.

	SCBC	603	Advanced Biochemistry Laboratory	2 (0-4-2)
*	SCBC	609	Structure and Mechanism of Enzymes	2 (2-0-4)
*	SCBC	610	Modern Metabolism	2 (2-0-4)
*	SCBC	612	Functional Genetics and Genomics	2 (2-0-4)
	SCBC	613	Advanced Skills in Biochemical Research	3 (3-0-6)
	SCBC	614	Advanced Biochemistry Seminar I	1 (1-0-2)
	SCBC	615	Advanced Biochemistry Seminar II	1 (1-0-2)
	SCBC	616	Advanced Biochemistry Seminar III	1 (1-0-2)
	SCID	506	Concepts of Molecular Bioscience	2 (2-0-4)
	SCID	518	Generic Skills in Science Research	1 (1-0-2)

* Students select to enroll one of these three courses most related to the student's research.

For students from M.Sc.

	SCBC	607	Current Topics in Biochemistry	3 (3-0-6)
	SCBC	613	Advanced Skills in Biochemical Research	3 (3-0-6)
	SCBC	614	Advanced Biochemistry Seminar I	1 (1-0-2)
	SCBC	615	Advanced Biochemistry Seminar II	1 (1-0-2)
	SCBC	616	Advanced Biochemistry Seminar III	1 (1-0-2)

12.3.2 Elective Courses

Credits (lecture-lab-self study)

	SCBC	611	Current Protocols in Biomolecular Research	1 (1-0-2)
	SCBC	617	Bioinformatics and Molecular Systems Biology	2 (2-0-4)
	SCBC	618	Stem Cell and Cancer Bioscience	3 (3-0-6)
	SCID	500	Cell and Molecular Biology	3 (3-0-6)
	SCID	502	Cell Science	3 (3-0-6)
	SCID	503	Systemic Bioscience	3 (3-0-6)
#	SCID	506	Concepts of Molecular Bioscience	2 (2-0-4)
	SCID	507	Microscopic Technique	1 (0-2-1)
	SCID	508	Biomolecular and Spectroscopy Techniques	1 (0-2-1)
	SCID	509	Separation Techniques	1 (0-2-1)
	SCID	510	Immunological Methods	1 (0-2-1)
	SCID	511	Gene Technology	1 (0-2-1)
	SCID	512	Receptor Binding and Enzyme Kinetic Assays	1 (0-2-1)
+	SCID	518	Generic Skills in Science Research	1 (1-0-2)
	SCBT	602	Gene Regulation	3 (3-0-6)

Required AUDIT course for students who have not passed SCID506 before

+ Recommended as electives for M.Sc. graduate from other programs

Note: Besides the above elective courses, students can enroll in other courses offered by graduate programs of Mahidol University with approval from the program director, major advisor, or program administrative committee.

12.3.3	<u>Dissertation</u>	<u>Credits (lecture-lab-self study)</u>
	Plan 1: Research only	
	Plan 1.1: For students with a Master's degree	
	SCBC 898 Dissertation	48 (0-144-0)
	Plan 2: Coursework and research	
	Plan 2.1: For students with a Master's degree	
	SCBC 699 Dissertation	36 (0-108-0)
	Plan 2.2: For students with a Bachelor's degree	
	SCBC 799 Dissertation	48 (0-144-0)

12.3.4 Research Projects of the Program

Staff at the Department of Biochemistry has received many research grants from local agencies (e.g. National Science and Technology Development Agency (NSTDA), Thailand Research Fund (TRF), TRF-Golden Jubilee, National Research Council of Thailand (NRCT)) and overseas granting agencies (e.g. World Health Organisation (WHO), Wellcome Trust and Third World Academy of Science (TWAS)). Major research interests in the Department are:

- Protein and enzyme structure and function
- Gene regulation and metabolism
- Molecular cancer
- Regenerative medicine
- Biotechnology and nanotechnology

12.4 **Course Code Explanation**

The first two letters are abbreviation of the faculty offering the course.

SC = Faculty of Science

The last two letters are abbreviation of the department or the major offering the course.

ID = Inter-departmental Courses

BC = Department of Biochemistry

BT = Department of Biotechnology

The three digits after the abbreviation, 5XX, 6XX, 7XX and 8XX, indicate graduate level courses.

12.5 **Study Plan**

Plan 1: Research only

Plan 1.1: For students with a Master's degree

Year	Semester 1			Semester 2		
1	SCBC 898	Dissertation	8(0-24-0)	SCBC 898	Dissertation (continued)	8(0-24-0)
		Qualifying Examination			Proposal Examination	
	Total		8 credits	Total		8 credits
2	SCBC 898	Dissertation (continued)	8(0-24-0)	SCBC 898	Dissertation (continued)	8(0-24-0)
	Total		8 credits	Total		8 credits
3	SCBC 898	Dissertation (continued)	8(0-24-0)	SCBC 898	Dissertation (continued)	8(0-24-0)
	Total		8 credits	Total		8 credits

Students may register for other courses as audit with the recommendation and approval of the Program Committee and/or the advisor.

This program revision has been approved by Mahidol University Council on September 21, 2022 and by Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation on November 6, 2023.

Plan 2: Coursework and research

Plan 2.1: For students with a Master's degree

Year	Enroll before semester 1 of the first year					
	Semester 1		Semester 2			
	SCID 506 Concepts of Molecular Bioscience 2(2-0-4) AUDIT #					
1	SCBC 607	Current Topics in Biochemistry	3(3-0-6)	SCBC 613	Advanced Skills in Biochemical Research	3(3-0-6)
	Elective courses		0-3 credits	Elective courses		0-3 credits
	Total		3-6 credits	Total		3-6 credits
2	SCBC 614	Advanced Biochemistry Seminar I	1(1-0-2)	SCBC 615	Advanced Biochemistry Seminar II	1(1-0-2)
	Qualifying Examination			SCBC 699	Dissertation Proposal Examination	9(0-27-0)
	Total		1 credit	Total		10 credits
3	SCBC 699	Dissertation (continued)	9(0-27-0)	SCBC 616	Advanced Biochemistry Seminar III	1(1-0-2)
				SCBC 699	Dissertation (continued)	9(0-27-0)
	Total		9 credits	Total		10 credits
4	SCBC 699	Dissertation (continued)	9(0-27-0)			
	Total		9 credits			

Required auditing course for students who have not passed SCID506 before

Plan 2.2: For students with a Bachelor's degree

Year	Semester 1			Semester 2		
	1	SCBC 609	Structure and Mechanism of Enzymes	2(2-0-4) *	SCBC 603	Advanced Biochemistry Laboratory
	SCBC 610	Modern Metabolism	2(2-0-4) *	SCBC 613	Advanced Skills in Biochemical Research	3(3-0-6)
	SCBC 612	Functional Genetics and Genomics	2(2-0-4) *	Elective courses		4-6 credits
	SCID 506	Concepts of Molecular Bioscience	2(2-0-4)			
	SCID 518	Generic Skills in Science Research	1(1-0-2)			
	Elective courses		5-7 credits			
	Total		10-12 credits	Total		9-11 credits
2	SCBC 614	Advanced Biochemistry Seminar I	1(1-0-2)	SCBC 615	Advanced Biochemistry Seminar II	1(1-0-2)
	Qualifying Examination			SCBC 799	Dissertation Proposal Examination	4(0-12-0)
	Total		1 credit	Total		5 credits
3	SCBC 799	Dissertation (continued)	6(0-18-0)	SCBC 616	Advanced Biochemistry Seminar III	1(1-0-2)
				SCBC 799	Dissertation (continued)	6(0-18-0)
	Total		6 credits	Total		7 credits
4	SCBC 799	Dissertation (continued)	8(0-24-0)	SCBC 799	Dissertation (continued)	8(0-24-0)
	Total		8 credits	Total		8 credits
5	SCBC 799	Dissertation (continued)	8(0-24-0)	SCBC 799	Dissertation (continued)	8(0-24-0)
	Total		8 credits	Total		8 credits

* Students select to enroll 1 of these 3 courses most related to the student's research.

13. Qualifying Examination

Before taking the qualifying exam, student must

- Meet the entry English proficiency requirements of the Faculty of Graduate Studies, Mahidol University.
- Pass SCID506 (for the students starting from B.Sc.), and at least one of the following core courses: SCBC609, SCBC610, or SCBC612, with at least B grade (for Plan 2 students starting from B.Sc. and M.Sc. from other programs).

The qualifying examination consists of written examinations that evaluate the students' basic knowledge in biochemistry, as well as their ability to integrate and apply their knowledge in analyzing experimental data and synthesize new knowledge.

Students that do not pass the qualifying examination in the first round can have re-examination with once.

14. Dissertation Research Proposal Presentation

After passing the qualifying examination, students must submit a document to the Faculty of Graduate Studies for appointment of Dissertation Research Proposal Committee consisting of at least 3 faculty members, one of which is student's major advisor while other two can be any academic staff within or outside Mahidol University. After approval of dissertation research proposal, this same committee will serve as Dissertation Advisory Committee monitoring and providing guidance to student regarding his/her doctoral research.

15. Dissertation Defense

Upon completion of doctoral research and dissertation writing and approval from the Dissertation Advisory Committee, students must submit a document to the Faculty of Graduate Studies for appointment of the Dissertation Defense Committee consisting of at least 5 members: a committee chair, an external examiner and the Dissertation Advisory Committee (at least 3 members). After passing the oral dissertation defense, students must submit the final written dissertation to the Faculty of Graduate Studies.

16. Collaboration with Other Departments

Many of our faculty members are members of multidiscipline research centers such as Center for Excellence in Protein and Enzyme Technology, Center of Excellence for Vectors and Vector-Borne Diseases, Center of Excellence for Shrimp Molecular Biology and Biotechnology, Center of Calcium and Bone Research, Center for Neuroscience, Integrative Computational Bioscience Center. We also have collaborations with scientists at other research institutes and universities in Thailand and overseas.

17. Students Job Opportunities

A large number of our student alumni work as staff in universities, researchers in research institutes, or as scientists in food, pharmaceutical, cosmetic and chemical industries.