

Ministry of Education
King Saud University
Deanship of Graduate Studies



PhD in Biochemistry
(Thesis with some Courses Option)

1438/1439H

2017/2018G

- **Introduction:**

Biochemistry is the science which deals with study of biological systems and the chemical reactions occurring inside them at the molecular level. Thus, it has obvious applications in other disciplines such as medicine, dentistry, pharmacology, medical, agricultural, biological sciences and chemistry. Since its first establishment in 1401H (1980G), the biochemistry department at King Saud University has maintained a standard in teaching and research to stay up-to-date in the field. In addition, it provides specialized personals in different areas of research who contribute effectively to enrich knowledge and serve the market sector (government or private) both locally and globally. To date, it has produced more than 1000 undergraduates and more than 100 MSc graduates. With the increasing number of graduate students and the challenges of the scientific future associated with the accompanying boom of progress in the Kingdom of Saudi Arabia, it has become necessary to upgrade the skills of graduates to the doctoral level. The department has members of faculty with diverse specialties and as well as a wide range of research laboratories and chairs (reflected in scientific publishing in professional journals). This provides a favorable environment to start and establish the PhD program in Biochemistry. The PhD in Biochemistry will not only keep our graduates up to date with the latest findings of scientific development but will also cater to the escalating demand by both local and overseas (mainly from African and Asian countries) students to join Doctoral degree programs.

- **Degree Name:**

PhD in Biochemistry

- **Program's language:**

English

- **Significance and Justifications of Program Creation / Amendment**

1. Increasing numbers of Biochemistry graduates who obtained a master's degree.
2. Preparation of qualified outstanding researchers.
3. The new developments in scholarship regulations with options for students who have certain circumstances abandon them from traveling abroad for higher education.
4. Preparation of the distinguished graduates for the market sector.
5. Completing the Academic Accreditation system of the department.

- **Program's Vision**

Professional excellence in the field of biochemistry researches both locally and nationally; to keep pace with the process of local and international renaissance and development.

- **Program's Mission**

Providing scientific and research environment supporting both teaching and learning processes and raising the level of the scientific research and academic studies in the field of biochemistry; to prepare a generation of biochemistry postgraduates capable of finding prospective solutions to scientific challenges, that the society might face, through constructive intellectual dealing and participating in fulfilling the local and national needs in the field of biochemistry.

- **Program's Objectives**

1. To enable the distinguished recipients of a master's degree in biochemistry and life sciences to continue to develop their abilities for a PhD and to serve the scientific and academic research.
2. To provide the Saudi labor market with high-capacity scientifically trained personnel carrying PhD degree in biochemistry.
3. The development of scientific research and academic profile of the students through organizing seminars in which students actively participate. ,
4. Transfer the experiences of faculty members for a new generation of researchers and keep abreast with the latest global research trends.
5. Innovation of research programs to meet the local requirements to support the development plans of scientific and research excellence and to contribute to the cognitive development of the national economy.

- **Program's Outcomes**

- A- Knowledge and Comprehension:**

- 1. Understand and simplify scientific problems facing the researcher.
 2. Familiarity with a broad knowledge of biochemistry and diverse specialties.
 3. The ability to absorb and understand the developments in the field of biochemistry.

- B- Mental Skills:**

- 1. The ability to develop and analyze scientific data.
 2. Analysis of developments in the areas of Applied Biochemistry and understanding them from a scientific perspective.
 3. Objective evaluation of the results of laboratory experiments.

- C- Professional and Practical Skills:**

- 1. Ability to write any specialized research project in biochemistry
 2. Independently and professionally Ability to fully comprehend the experiments and research methodology in the field of biochemistry.
 3. Ability to create a research team and communicate with each other.

- D- General Skills:**

- 1. To establish a community that is professionally and academically distinct in the field of biochemistry.
 2. To establish a community having a robust outlook of the specialized scientific research together with sophisticated scientific knowledge and perceptions.
 3. To increase community awareness about the science of biochemistry and its subsidiaries.

- **Program's Beneficiaries:**

- The program will provide PhD candidates equipped with education and skills necessary for employment not only in academia but also outside academia, in various government and private sectors

- **Employment Opportunities Available:**

- 1. Medical Laboratory
 2. Forensic laboratories
 3. Universities
 4. Laboratories for Specifications and Measurements
 5. Food and Drug Authority
 6. Research centers
 7. Laboratories in pharmaceutical and agricultural companies.

- **Admission Requirements**

In addition to the general conditions set forth in Article XIII Regulations for Graduate studies the following conditions will also apply:

1. To have a master degree in biochemistry or related specialties from King Saud University or its equivalent with a very good grade (if from a University that offer a grade) and no more than five years from getting the master degree.
2. To pass the written examination conducted by the department.
3. To pass the personal interview conducted by the department.
4. To get the TOEFL-iBT (45) on internet TOEFL or its equivalent.

- **Requirements for Obtaining the Degree:**

The requirements for obtaining the Degree are as follows:

- **Thesis with some Courses Option**

- A- Passing 19 study units of the program.
- B- Passing successfully the Comprehensive Exam.
- C- Successful completion of doctoral Thesis.

- **Program's Tracks (if any):**

The program has the following tracks:

1. Applied Biochemistry
2. Clinical Biochemistry

- **Program's General Structure:**

- **Thesis with some Courses Option**

The required study units are 19 study hours in addition to 24 study hours for the thesis as shown in the following table:

Type of Courses	No. of Courses	No. of Units Required
Core Courses	9	(16) study hours
Elective Courses	5	(3) study hours
Comprehensive Exam	1	(0)
Thesis	1	(24) study hours
Total	16	(19) study units + (24) study units for thesis

• **Program's Study Plan:**

❖ **First Level**

#	Course Code	Name	No. of Study Units	Prerequisite Course
1	BCH601	Advances in applied biochemistry	2 (2+0)	
2	BCH602	Advanced bioanalytical techniques	2 (2+0)	
3	BCH603	Recent aspects of molecular genetics	2 (2+0)	
4	BCH604	Advanced topics in biochemical research	2 (2+0)	
5	BCH605	Bioethics	1 (1+0)	
Total			9 study units	

❖ **Second Level**

#	Course Code	Name	No. of Study Units	Prerequisite Course
1	BCH606	Advances in genomics and bioinformatics	2 (2+0)	
2	BCH607	Advanced topics in metabolism	2 (2+0)	
3	BCH608	Biochemical and protein engineering	2 (2+0)	
4	BCH699	Thesis proposal preparation	One study unit	(9) study units
5	BCH ...	Elective Course (1)	1 (1+0)	
6	BCH ...	Elective Course (2)	2 (2+0)	
Total			10 study units	

❖ **Elective Courses: Student selects only two courses with a total of 3 study units**

#	Course Code	Name	No. of Study Units	Prerequisite Course
1	BCH609	Bionanotechnology	2 (2+0)	
2	BCH610	Genetic manipulations and therapy	2 (2+0)	
3	BCH611	Recent aspects in biochemical cell signaling	2 (2+0)	
4	BCH612	Biochemical data analysis	1 (1+0)	
5	BCH613	Seminars in biochemistry	1 (1+0)	

❖ **Third Level:**

#	Course Code	Name	No. of Study Units	Prerequisite Course
1	Com700	Comprehensive Exam	0	(19) study units

❖ **Fourth Level**

#	Course Code	Name	No. of Study Units	Prerequisite Course
1	BCH700	Thesis	(24) study units	BCH699, Com700
Total			(19) study units + (24) study units for thesis	

• **Description of Courses:**

BCH601	Advances in applied biochemistry	2(2+0)
Methods and techniques associated with biomolecule separation and purification. Biochemical sensor design, biochemical fuel cell applications, bioremediation and biodegradation. Industrial carbohydrate applications. Eicosanoids, heat shock proteins and interferons identification. Applications of enzyme immobilization. Biomolecular electrode technology.		
BCH602	Advanced bioanalytical techniques	2(2+0)
Biochemical methods used in next generation sequencing, 3D imaging, protein crystallization, macromolecule engineering, large scale production and stabilization of recombinant protein, protein PEGylation, circular dichroism, Any new technique invented in the field of biochemical research that evaluated structure- function relationships will be included.		
BCH603	Recent aspects of molecular genetics	2(2+0)
Nucleic acid structure and topology, genome structure and its stability, the regulation of gene expression at the levels of transcription, post-transcriptional processing, translation, post-translational modification; DNA damage, mutagenesis and repair. Transposons and site-specific recombination and recombinant DNA technology and genetic engineering with their applications.		
BCH604	Advanced topics in biochemical research	2(2+0)
Recent aspects in peptides, proteins structure, enzyme function, carbohydrate metabolism, lipid metabolism, oxidative phosphorylation, photosynthesis and carbon fixation, nitrogen metabolism, integration of metabolism, nucleic acids, replication, transcription, immunology and cancer biochemistry.		
BCH605	Bioethics	1(1+0)
Scientific integrity and compliance with regulations for laboratory research. Ethical issues in life science. Principles of bioethics and technology. Recognize and compare biochemistry (science) and ethics (philosophy). Bioethical problems. Provide rational justification for ethical decisions.		
BCH606	Advances in genomics and bioinformatics	2(2+0)
Human molecular genetics, whole genome alignment, next generation sequencing data, comparative genomics, phylogenetic, biological database, system biology, simple Mendelian diseases, complex diseases, functional genomics, population genetics, epigenetics, SNPs, copy number and structural variations, personal and clinical genomics, cancer genomics. Metagenomics and metatranscriptomics.		
BCH607	Recent advances in metabolism	2(2+0)
Pathways of intermediary and secondary metabolism. Regulation of these pathways. Relation between human diseases and metabolic pathways. Role of nutrition in the prevention and treatment of disease. Metabolism of vitamins and minerals. Unusual pathways of metabolism. Detailed nucleotides and amino acids metabolism. Integration of metabolic systems. Electrolyte and fluid balance.		
BCH608	Biochemical and protein engineering	2(2+0)
Concepts of biochemical and protein engineering and their applications. Compare amino acid sequence and structure of proteins, and relate this information to the function of proteins. Techniques used for creating and modifying the structure of biomolecules. Protein and biocatalyst engineering. Models of biologically engineered enzymes. Tissue engineering.		
BCH609	Bionanotechnology	2(2+0)
Techniques and concepts used in bionanotechnology. Characterization of biomaterials and development of bionanotechnology-based devices. Implementation of bionanotechnology in		

toxicology, cancer biology, life sciences, biochemistry, DNA sequencing and delivering biomolecules to target cells.		
BCH610	Genetic manipulations and therapy	2(2+0)
Gene manipulation in the Post-Genomics Era. Cutting and joining DNA molecules. Plasmids, phage and cosmids cloning strategies. Site-directed mutagenesis, manipulating DNA in different living organisms (bacteria, yeast, fungi and animal cells), advanced transgenic technology. Applications of gene manipulation in practical life.		
BCH611	Recent aspects in biochemical cell signaling	2(2+0)
Membrane transport. Cell communication. Signal transduction through receptor activation, and the generation of second messengers. Ion channel functions. Cell signaling and apoptosis. Different receptors families: e.g., protein kinases, growth factor receptors, G-proteins, Phospholipase and Phosphoinositide 3-Kinase, insulin receptor, and nuclear receptors.		
BCH612	Biochemical data analysis	1(1+0)
Mathematical biology concepts. Tools for describing and summarizing data; inference methods on population means and proportions; statistical hypothesis testing; group comparisons; simple linear regression; categorical data analysis; power and sample size in study designs.		
BCH613	Seminars in biochemistry	1(1+0)
Practice in preparing and presenting an oral presentation of any recent research in biochemistry. Explaining used techniques. Integrate various pieces of knowledge that has obtained. Ability to answer wide aspects of questions. Ability to participate in group discussions.		
BCH699	Prepare a search plan	1(1+0)
Instructing the student to select the subject of the thesis and identify the research problem, and help in preparing the research plan for the research point chosen according to the general framework of the research plan.		
BCH700	Thesis	1(1+0)
The research plan for the PhD thesis is implemented. Where students first work on designing a plan to manage and analyze the problem in question. And then perform laboratory experiments to devise the next step in the research. At each stage of the research, a detailed discussion with the faculty supervisor of the thesis will be carried out to guide the student in the selection of ways to analyze the results of the research, critique it and how to display and publish.		