

## Program SPECIFICATION FOR PhD Degree in Biochemistry

Code: 1701800

University: Alexandria

Faculty: Medical Research Institute

### Program Specification

#### A- Basic information

1- Program title : PhD in Biochemistry

2- Program type:    single        double        multiple   

3- Department(s): Biochemistry

4- Coordinator: Prof. Dr. Magda Megahed

5- External evaluator(s): Dr. Galila Ahmed Yakout

6- Last date of program specification approval: 5/6/2014

#### B- Professional Information

##### 1- Program aims:

All the students receive theoretical and practical training in different fields of biochemistry and molecular biology to be able to:

- Recognize latest advances in biochemistry and molecular biology which are the bases of many areas of medicine.
- Describe and explain in molecular terms, all the chemical process of living cells.
- Integrate biochemical and molecular biology knowledge into efforts to maintain health and to understand diseases to help treating them effectively.
- Apply biochemical techniques in laboratory to assist in scientific and medical research.
- Improve scientific and communications skills.
- Analyze problems, postulate solutions, and plan scientific protocols.
- Work as part of a team.

- Use systemic approaches to design and conduct scientific research.
- Conduct research studies that add to the existing specialty knowledge

## 2- Intended learning outcomes ( ILOS )

### a- knowledge and understanding:

- a1- Discuss The basic knowledge of cell signaling, receptors and growth factors.
- a2- Discuss proteomic analysis and neurochemistry.
- a3- Review eicosanoids, atherogenesis, angiogenesis and methods of cancer control, and chemotherapy.
- a4- Explain tumor markers, stem cells and pollution.
- a5- Recall restriction enzymes, recombinant DNA techniques and cloning vectors.
- a6- Discuss RNA interference (RNAi), microRNA and Human Genome Project.
- a7- Describe Protein turnover, selective degradation, regulation of protein translation at the level of translation, genetic diseases, and gene therapy.
- a8- Define secretory protein, lysosomal proteins, protein folding, DNA replication and mitochondrial DNA.
- a9- Design, conduction & explore publishing of scientific research.

### b- Intellectual skills:

- b1- Differentiate between mechanisms of receptor signaling.
- b2- Examine proteomic analysis experiment and analyze proteomic data.
- b3- Examine the role of different types of eicosanoids.
- b4- Categorize stem cell treatments.
- b5- Differentiate between different types of restriction enzymes, and different cloning techniques.
- b6- Examine the function of microRNA and RNAi.
- b7- Differentiate between the pathways of protein degradation and turnover.
- b8- Compare between different pathways of protein folding and targeting, normal common and rare DNA replication mechanisms, gene expression control in nucleus and mitochondria, and nuclear and mitochondrial DNA.
- b9- Prepare scientific articles/papers to be published in indexed journals.

### c- professional and practical skills:

- c1- Apply appropriate Assay to determine free radicals.
- c2- Apply appropriate Assay to determine antioxidant Enzymes.
- c3- Practice stem cell isolation.

- c4- Practice techniques to isolate and quantify DNA and RNA such as spin column extraction and agarose electrophoresis.
- c5- Practice PCR and RT-PCR techniques for different application.
- c6- Interpret PCR and RT-PCR results using gel documentation system.

**d- General and transferable skills:**

- d1-Develop the communication skills through group discussion and lectures and share discussion about other's work.
- d2- Use different sources to extract information and knowledge e.g. books, research articles, thesis, websites, etc.
- d3-Assess his learning needs through exams, assignments, and discussions.
- d4- Design a time plan for his work during practical sessions and work in group.
- d5- Solve problems on ethical scientific basis will pave the ways to be an effective team leader during practical session and seminars.
- d6- Develop independent learning skills through assignments and seminars.

**3- Academic standards**

**3a External references for standards (Benchmarks)**

Generic Academic Reference Standards of the National Authority for Quality Assurance and Accreditation of Education (NAQAAE)

adopted at MRI council 12/2/2014 and re-adopted at 15/1/2023

**Last date of Academic Reference standards (ARS) approval by Institute Council: 15/1/2023**

**3b Comparison of provision to selected external references**

Generic Academic Standards of NAQAAE	ARS of PhD. of Biochemistry
A1-Basic facts, theories, of the specialty and related subjects/ fields.	a1- Recognize the fundamental principles of biochemistry and molecular biology covering all aspect of normal cells and the abnormality that cause diseases.
A2-Mutual relation between professional practice and effects on environment.	a2- Describe the importance of biochemical tests in clinical medicine and interpretation of the results of laboratory lab.
A3-Recent advances in the field of practice.	a3- Discuss new topics in the field of research.

A4-Details of ethical & legal practice.	a4- Recognize ethical and legal aspects of scientific research.
A5-Quality standards of the practice.	a5- Recognize quality standards in biomedical laboratory.
A6-Design, conduction & publishing of scientific research.	a6-Report to publish scientific research through thesis.
A7-Ethical considerations in different types of scientific research.	a7- Recognize quality standards in biomedical laboratory.
	a8- Design, conduction & explore publishing of scientific research.
B1-Analyze, deduce, extrapolate & evaluation of information.	b1- Analyze the information in different and recent biochemistry and molecular biology topics to understand their relation to health and disease.
B2-Solve the majority of problems in the specialty according to the available data ( complete or incomplete).	b2- Appraise the resulting data through thesis.
B3-Conduct research studies that add to the existing specialty knowledge.	B3- Conduct research studies that add to the existing specialty knowledge
B4-Publish scientific articles/papers (in indexed journals).	B4- Prepare scientific articles/papers to be published in indexed journals.
B5-Plan and implement (or supervise implementation of) enhancement & Improvement approaches to practice.	b5- Compare between the existing knowledge and the recent advances of biochemistry and molecular biology.
B6-Take decisions in various professional situations (including dilemmas & controversial issues).	b6- Appraise various professional situations through practical sessions and group discussions.
B7-Add to the specialty field through creativity & innovation.	b7- Criticize the current problems in biochemistry and molecular biology to add to them creativity & innovation through thesis.
B8-Manage discussions on basis of evidence and proofs.	b8- Examine biochemistry and molecular biology topics to manage discussions on basis of evidence and proofs, through

	discussions during lectures and thesis.
C1-Competent in all basic and all required advanced professional skills (to be determined according to the specialty board/ department).	c1- Practice biochemical and molecular biology techniques.
C2-Write and appraise reports.	c2- Interpret the obtained data to present it in its appropriate format.
C3-Evaluate and improve methods and tools used in specialty.	c3- Correspond the used methods to the recent and applicable techniques.
C4-Use technology to advance practice.	c4- Use the available technology to advance practice of biochemistry and molecular biology.
C5-Plan professional development courses to improve practice and enhance performance of juniors.	c5- Employ professional development courses to improve practice and enhance performance of juniors.
D1-Communicate effectively using all methods.	d1- Develop the communication skills through group discussions, lectures and training workshops.
D2-Use information technology to improve his/her professional practice.	d2- Use information technology to improve his professional practice (e.g. statistics programs, bioinformatics, etc.).
D3-Teach and evaluate others.	d3- Teach and evaluate others through discussions during lectures.
D4-Perform self-appraisal& seek continuous learning.	d4-Determine students learning needs through assignments and discussions.
D5-Use different sources of information to obtain data.	d5- Use different sources of information to obtained data e.g. books, research articles, thesis, academic websites, etc.
D6-Work as team leader as well as a member in larger teams.	d6- Solve problems on ethical scientific basis, all pave the ways to be an effective team leader during practical sessions and seminars.
D7-Manage scientific meetings and appropriately utilize time.	d7- Manage scientific meetings and set a time plan for practical sessions and thesis

	work.
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## 4- Curriculum structure and contents

**4.a program duration: 2.5-5 years**

**4.b program structure :**

**4.b.i- No. of hours per week in each year/semester:**

Semester	Core Courses	Elective Courses
	No. of hours	No. of hours
First semester	6	3
Second semester	4	
Third semester	4	3
Fourth semester	4	

**4.b.ii- No. of credit hours**

Lectures	20	Practical	4	Thesis	24	Total	48
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Compulsory	18	Elective	6	Optional	0
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**4.b.v- No. of credit hours of specialized courses**

No.	18	%	75
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**4.b.vi- No. of credit hours of other courses**

No.	6	%	25
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**4.b.vii-Field Training**

No.	-	%	-
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**4.b.viii- Program levels (in credit-hours system)**

Student is required to pass at least 12 credit hours with CGPA not less than C+ before submitting a thesis proposal.

## 5- Program Courses

**5.1- Compulsory (18 Cr)**

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1701801	Biochemistry V	3	2	2
1701802	Biochemistry VI	2	2	-----
1701803	Biochemistry VII	2	2	-----
1701804	Biochemistry VIII	2	2	-----
1701805	Molecular Biology V	3	2	2
1701806	Molecular Biology VI	2	2	-----
1701807	Molecular Biology VII	2	2	-----
1701808	Molecular Biology VIII	2	2	-----
<b>total</b>		<b>18</b>	<b>16</b>	<b>4</b>

**5.2- Elective I (3Cr)**

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1703820	Physiology	3	2	2
1704820	Pharmacology	3	2	2
1705820	Hematology	3	2	2
1717820	Chemical Pathology	3	2	2

**5.3- Elective II (3Cr)**

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1706820	Bacteriology	3	2	2
1707820	Parasitology	3	2	2
1708820	Immunology	3	2	2
1709820	Histochemistry and cell biology	3	2	2
1712820	Medical Biophysics	3	2	2
1713820	Human genetics	3	2	2
1721820	Medical statistics	3	2	2

**5.4- Optional – (none)**

## 6- Program admission requirements

Graduate students with a M.Sc. of Biochemistry or Applied Chemistry or an equivalent degree of the faculties of Medicine, Pharmacy, Science or Veterinary.

## 7- Teaching and Learning Methods

Lecture

Practical/Clinical

Brainstorming

Discussion Groups

Problem Solving

Self-Directed Learning

Project

## Regulations for progression and program completion

For the progression and completion of the program to obtain the degree of Ph.D, the student must:

- 1- Complete 24 credit hours with CGPA of at least C+ through courses.
- 2- Complete 24 credit hours with through thesis.
- 3- Submit a thesis validity report by an examination committee approved by the department council and their members include at least two external examiners.

## 8- Evaluation of Students enrolled in the program.

Tool evaluation	Intended learning outcomes being assessed
Written	ILOs a &b
Practical	ILOs c
Oral	ILOs a ,b &d
Semester Work	ILOs b & d



## Evaluation of the Program

Evaluator	Tool	Sample
1- Senior students	Questionnaire	At least 50 %
2- Alumni	Questionnaire	Representative sample
3- Stakeholders (Employers)	Meeting	Representative sample
4- External Evaluator(S) or External Examiner (s)	Report	Dr. Galila Ahmed Yakout
5- Other		

### Program coordinator:

Name: Dr. Nesma Ali Ali Ghazal

Signature:



### Department Head:

Name: Prof. Dr. Maher Abdel- Nany Kamel

Signature:



**Date of Department Council Approval: 26-9-2023**

**Program Aims vs Graduate Attribute matrix**

**Graduate Attributes of Ph.D. Program in Biochemistry**

Generic Graduate Attributes of NAQAAE	Graduate Attributes of Doctor of Philosophy in Biochemistry.	Program aims
	By the end of this program, the Graduate of Doctor of Philosophy in Biochemistry should be able to	
Master the basics and methodologies of scientific research.	Recognize the fundamental principles of biochemistry and molecular biology covering all aspects of normal cells and the abnormality that causes diseases.	Describe and explain in molecular terms, all the chemical processes of living cells.
Work continuously to add to his/her knowledge in the field of specialty.	Criticize the current problems in biochemistry and molecular biology to add to their creativity & innovation through thesis.	Conduct research studies that add to the existing specialty knowledge
Apply the analytical and critical approach to knowledge in the field of specialty and related fields.	Describe the importance of biochemical tests in clinical medicine and the interpretation of the laboratory results.	Recognize the latest advances in biochemistry and molecular biology which are the bases of many areas of medicine.
Integrate knowledge in the field of specialty with related knowledge, deduce and develop relationships between them.	Analyze the information on different and recent biochemistry and molecular biology topics to understand their relation to health	Integrate biochemical and molecular biology knowledge into efforts to maintain health and to

	and disease.	understand diseases to help effectively in their treatments.
Demonstrate a deep awareness of current problems and modern theories in the field of specialty.	Examine the recent topics that add to the existing biochemistry and molecular biology knowledge.	Conduct research studies that add to the existing specialty knowledge
Identify professional problems and find innovative solutions to solve them.	Solve the majority of problems in the specialty according to the available by appraising the resulting data through thesis.	Analyze problems, postulate solutions, and plan scientific protocols.
Master a wide range of professional skills in the field of specialty.	-Recognize the recent advances in biochemistry and molecular biology fields.	Improve scientific and communication skills.
Develop new methods and tools for professional practice.	Correspond the used methods to the recent and applicable techniques.	Apply biochemical techniques in the laboratory to assist in scientific and medical research.
Use appropriate technological means to serve his professional practice.	Use information technology to improve his professional practice (e.g. statistics programs, bioinformatics, etc.).	Use systemic approaches to design and conduct scientific research.
Communicate efficiently and lead work teams in various professional scenarios.	-Work in groups through practical sessions and workshops and communicate with others positively. -Solve problems on an ethical scientific basis, all pave the way to be an effective team leader during practical sessions and	Work as part of a team.

Take Decisions in light of available data.	seminars. -Criticize the problems faced during the thesis work to make decisions based on scientific concepts.	Analyze problems, postulate solutions, and plan scientific protocols.
Employ and develop available resources efficiently and work to find new resources.	-Use different sources of information to obtain data e.g. books, research articles, thesis and academic websites	Conduct research studies that add to the existing specialty knowledge
Show awareness of his/her role in community development and environmental preservation	-Develop communication skills through group discussions, lectures and training. -Teach and evaluate others through discussions during lectures.	Improve scientific and communication skills.
Act in a manner that reflects a commitment to integrity, credibility, and professionalism.	Conduct scientific research &/Or write a scientific systematic approach to a research problem (hypothesis) and then compare between obtained data and recent scientific publications through the thesis.	Use systemic approaches to design and conduct scientific research.
Commit to continuous self-development and transfer his/her knowledge and experiences to others.	Learn independently through assignments, seminars and e-learning use.	-Improve scientific and communication skills. -Work as part of a team.













