



**Zagazig University**  
**Faculty of Pharmacy**  
**Biochemistry Department**

**Program and Course Specifications**  
**Master and Ph.D.**  
**Degrees**

**2017/2018**

# **Master Degree**

# **Program Specification**

---

## Program Specification

### A- Basic Information

- 1- Program title:** M.Pharm. Sci Degree in **Biochemistry**
- 2- Program type:** Single
- 3- Faculty/ University:** Faculty of Pharmacy, Zagazig University
- 4- Department:** Biochemistry
- 5- Coordinator:** Prof. Dr. Sousou Ibrahim
- 6- Date of program specification approval:** 2017/2018

### B- Professional Information

#### 1- Program aims:

Master's program, Zagazig University is a 3-5 five years pharmacy education offering a Master's degree in pharmaceutical sciences (Biochemistry). This Program aims at providing postgraduate students with knowledge, skills and abilities needed to practice the pharmacy profession effectively in various settings including Research Institutes, private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

#### The program aims are summarized as follows:

1. Provide the community with highly qualified and professionals with skills and ethical values based on National Academic Reference Standards (NARS).
2. Help acquire the necessary knowledge and skills in areas related to biochemistry, clinical biochemistry and molecular biology
3. Apply various recent quantitative techniques in clinical biochemistry & molecular biology in diagnosis of metabolic disorders
4. Develop communication skills, time management, critical thinking, problem solving, decision making, team working, using modern information technology, design and conduct research.

5. Implement the sense of self learning for continuous improvement of professional knowledge and skills.

#### **Graduate Attributes:**

Masters graduates work in a multidisciplinary profession and must acquire the necessary attributes in various biochemistry and molecular biology aspects for pursuing their career. Graduate attributes are the qualities, skills and understandings a faculty community agrees its students should develop during their time with the institution, these attributes include the disciplinary expertise and technical knowledge in the core of the studied course and research studies as follows:

- 1- Have the fundamental knowledge for practice of biochemistry and molecular biology
- 2- Apply the basic and modern professional skills for proper application in the field of biochemistry
- 3- Analyze, evaluate information and solve professional problems
- 4- Respect Moral and ethical principles for professional practice in the area of specialty
- 5- Conduct research, write and evaluate scientific reports
- 6- Develop continuous and self learning abilities
- 7- Communicate and work effectively in a team

#### **2-Intended Learning Outcomes (ILOs):**

**By the end of the program, graduates should demonstrate knowledge and understanding** and develop skills appropriate for **Biochemistry Master of sciences degree** as follows:

##### **2-1- Knowledge and Understanding :**

A.1- **Build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions**

A-2-Outline principle information on DNA and RNA, biotechnology and cell culture, recent medical biotechnology applications

A.3- Illustrate principles of tissue metabolism, abnormalities relevant to tissue metabolism

A.4-Evaluate interconnected metabolic pathways, metabolic adaptation and link metabolic pathways to the abnormalities expected.

A.5- Apply of clinical biochemistry & molecular biology in diagnosis of metabolic disorder (tumor and inflammatory, oxidative stress, changes associated with geriatric and pediatric)

A.6- Determine methodologies, tools and ethics of scientific research

A.7- Discuss principles and fundamentals of quality of professional practice in the field of biochemistry & molecular biology

A.8- Explain pharmacotherapeutic properties of different groups of drugs, mechanism of action, drug-drug interaction, toxic effects and risks and benefits of commonly used drugs.

A.9- Demonstrate full awareness of ethics in all aspects of scientific research.

### 2-2 - Intellectual Skills:

B-1- Select the most appropriate instrumental technique in pharmaceutical and biological assay in the field of biochemistry & molecular biology.

B-2- Analyze statistically and interpret biochemical and molecular laboratory data obtained from experiments in different forms.

B-3-Correlate the knowledge of different biochemical aspects to solve health problems

B-4- Suggest significant solutions for biochemical results and outcome errors based on a wide academic background.

B-5-Recognize possible hazards during work and how to deal with.

B-6- Design a laboratory protocol for a requested biochemical issue.

B-7- Evaluate various therapeutic strategies for individuals with high risk for disease and common medical conditions as well as the toxicity resulting from therapy.

B.8- Take professional decisions in the area of specialization

### **2-3 - Professional and Practical Skills:**

C.1-. Perform routine technical procedures including at a minimum venipuncture, blood collection, separation of plasma and serum samples and the appropriate storage method in each case

C.2- Select and apply biochemical and molecular reports as well as drugs related data.

C.3- Apply and use methods and tools existing in the area of biochemistry

C.4. Use some basic experiments in the basic sciences to be utilized in the research work

C.5- Use laboratory tests dealing with molecular techniques & equipments

C.6- Write with confidence reliable scientific reports in biochemical research and medical laboratories.

### **2-4 - General and Transferable Skills:**

**On successful completion of the Master degree Program, students will be able to:**

D.1- Interact effectively with patient and biochemistry professionals.

D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.

D.3- Practice self assessment of learning needs in the field of biochemistry.

D.4- Retrieve information from various sources in the field of biochemistry.

D.5- Set rules for judging others performance in the field of biochemistry and molecular biology.

D.6- Work effectively as a member of team.

D.7- Get maximum use of time to achieve goals.

D.8- Study independently and plan research studies.

### 3- Academic Standards:

- NARS (National Academic Reference Standards)

**Matrix:** Comparison between Master degree program ILOs and the Academic Reference Standards{ARS, 2009} developed by NAQAAE

	ARS	Program ILOs
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A-1-Build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions  A.8-Explain pharmacotherapeutic properties of different groups of drugs, mechanism of action, drug-drug interaction, toxic effects and risks and benefits of commonly used drugs.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A-2-Outline principle information on DNA and RNA , biotechnology and cell culture, recent medical biotechnology applications
	2.1.3- Scientific developments in the area of specialization.	A.3-Illustrate principles of tissue metabolism, abnormalities relevant to tissue metabolism  A.4-Evaluate interconnected metabolic pathways, metabolic adaptation and link metabolic pathways to the abnormalities expected.



		A.5- Apply clinical biochemistry & molecular biology in diagnosis of metabolic disorder (tumor and inflammatory , oxidative stress , changes associated with geriatric and pediatric )
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.6- Determine methodologies, tools and ethics of scientific research
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.7- Discuss principles and fundamentals of quality of professional practice in the field of biochemistry & molecular biology
	2.1.6- The fundamentals and ethics of scientific research.	A.9- Demonstrate full awareness of ethics in all aspects of scientific research.
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B-2- Analyze statistically and interpret biochemical and molecular laboratory data obtained from experiments in different forms.
	2.2.2- Solve specified problems in the lack or missing of some information.	B-4- Suggest significant solutions for biochemical results and outcome errors based on a wide academic background.
	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B-3- Correlate the knowledge of different biochemical aspects to solve health problems
	2.2.4- Conduct research and write scientific report on research specified topics.	B-1- Select the most appropriate instrumental technique in pharmaceutical and biological assay in the field of biochemistry & molecular biology

	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Recognize possible hazards during work and how to deal with.
	2.2.6- Plan to improve performance in the field of specialization.	B-6- Design a laboratory protocol for a requested biochemical issue. B-7- Evaluate various therapeutic strategies for individuals with high risk for disease and common medical conditions as well as the toxicity resulting from therapy
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.8- Take professional decisions in the area of specialization
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1-. Perform routine technical procedures including at a minimum venipuncture, blood collection, separation of plasma and serum samples and the appropriate storage method in each case C.4. Use some basic experiments in the basic sciences to be utilized in the research work
	2.3.2- Write and evaluate professional reports.	C.2- Select and apply biochemical and molecular reports as well as drugs related data. C.6- Write with confidence reliable scientific reports in biochemical research and medical laboratories
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Apply and use methods and tools existing in the area of biochemistry C.5- Use laboratory tests dealing with molecular techniques & equipments
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Interact effectively with patient and biochemistry professionals.
	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet

2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment of learning needs in the field of biochemistry
2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.
2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Set rules for judging others performance in the field of biochemistry and molecular biology
2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team
2.4.7- Manage time effectively.	D.7- Get maximum use of time to achieve goals.
2.4.8- Continuous and self learning.	D.8- Study independently and plan research studies

#### 4-Curriculum Structure and Contents:

**a- Program duration:** 3- 5 years

**b- Program structure:**

- The Masters program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

**1- Courses: General (1 year) and Special**

**No. of credit hours for program courses:**

Compulsory: 12

Elective: (2x4) 8

Special: (3x4) 12

**2- Thesis:** 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the

student must present (written and orally) a research proposal and write a thesis.

**3- General University Requirements:** 10 credit hours including:

a- TOEFL (400 units)

b- Computer course

**c-Program Curriculum:**

Course Code	Course Title	Credit hours	Program ILOs Covered
	General Courses:		
M110	1- Molecular Biology	4	A2, A7, B4,D2, D4, D8
M112	2- Physiology	2	A1, B3 , B6, B8, D1
M111	3- Biostatistics	2	A6, A9,B2 ,B8 ,D1
M102	4- Instrumental analysis	4	A6 ,A7, B1 ,B5 , D2
ME4	5- Elective A Biotechnology	4	A2, B3 D2, D4, D8
ME5	6- Elective B Applied Pharmacology	4	A8, B3 ,B4 ,B7 ,D1
ME7	Drug induced diseases	4	A8, B7 ,D1 ,D4
	Special Courses:		
Bsp1	Metabolism of individual tissues	4	A1, A3, A5, A8, B3, B4, D2, D4, D6, D8

Bsp3	Integration of metabolism	4	A1, A4, B2, B3, B4, D2, D4, D8
Bsp2	Advanced Biochemistry	4	A1, A5, A8, B2, B3, D2, D4, D6
	Thesis	30	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, B4, B5, B6, B7, B8, C1, C2, C3, C4, C5, D1, D2, D3, D4, D5, D6, D7, D8

## 5-Program admission requirements:

### General Admission Conditions

- The Applicant should finish or being permanently or temporarily exempted from the military service and temporary exemption should be valid for at least one year from the date of beginning of study. (Exceptions apply for demonstrators and assistant lecturers).
- The applicant admission to the M.Sc. program should be no later than ten years from the time of graduation.
- Acquisition of an approval from the Faculty Council following an approval of concerned Departmental Board as well as Graduate Studies and Research Committee recommendation within a maximum of one month for any conditions stated by the concerned Departmental Board.

### **Admission Conditions for M.Sc. degree**

In addition to the general admission conditions stated before, applicants are admitted to M.Sc. degree upon fulfillment of the following:

The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy with a general grade at least good affiliated to the Egyptian Universities or an equivalent degree granted by any institute recognized by the Supreme Council of Universities.

The Faculty council is allowed, on consent of the concerned Departmental Board as well as Graduate Studies and Research Committee, to accept student for registration of M.Sc. degree if he has got a diploma from one of the Egyptian Universities in one of the pharmaceutical sciences fields, Faculties, or Institutes that are recognized by the Supreme Council of Universities with a general grade of Good regardless his grades in bachelor degree.

Students should fulfill all the admission requirements stated by the concerned Departmental Board (ICDL certificate, local TOEFL certificate with a grade at least 450).

Admission has to be done within the period announced by the university.

Candidate thesis discussion isn't before one calendar year from research point registration.

### **Regulations to complete the program:**

#### **Conditions of granting the degree**

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research

Committee recommendation awards the M.Sc. degree upon fulfillment of the following requirements:

- Carrying out a deep research in the area of specialization for at least one or two calendar years and at most three years from the time of registration.
- The student has to succeed in all courses examinations.
- Acceptance of the research thesis by the Jury Committee according to statement 104 of universities regulating law.

### **Cancellation of Registration**

The Faculty Board is allowed to cancel registration for M. Sc. programs in the following circumstances

- Student's failure to pass the course examinations for two times.
- Student's nonattendance or unsatisfactory progress (at least two annual reports) in research work being reported by the advisors and chief supervisor to the Departmental Board and forwarded to the Graduate Studies and Research Committee recommendation for approval of cancellation.
- Dissertation refusal by the Jury Committee.
- Incapability of the student to graduate by the deadlines indicated.

## **6- Admission Policy:**

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

**7-Student assessment methods:**

Method	ILOS
Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills
Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

**8-Failure in Courses:**

Students who fail to get 60% (1 point)



---

**9-Methods of program evaluation**

<b>Evaluator</b>	<b>Method</b>	<b>Sample</b>
<b>Internal evaluator:</b> Professor Dr. Hoda El-sayed	Program evaluation Courses evaluation	Program report Courses report
<b>External evaluator:</b> Professor Dr. Mamdouh El-sheshtawy	Program evaluation Courses evaluation	Program report Courses report
<b>Others methods</b>	Matrix with ARS Questionnaires	<b>100%</b>

**Program coordinator****Prof. Dr. Sousou Ibrahim****Head of Department****Prof. Dr. Sahar El-Swefy**

Masters of Biochemistry (2017/2018)																												
Program Courses		Program intended learning outcomes																										
		Knowledge and understanding									Intellectual skills								Professional and practical skills						General an			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	B1	B2	B3	B4	B5	B6	B7	B8	C1	C2	C3	C4	C5	C6	D1	D2	D3	
General courses	Molecular Biology		√					√						√													√	
	Physiology	√										√			√		√								√	√		
	Bioststistics						√			√		√					√								√			
	Instrumental analysis						√	√			√				√											√		
	Biotechnology		√										√													√		
	Drug induced disease								√								√								√			
	Applied pharmacology								√				√	√			√									√		
courses	Metabolism of individual tissues	√		√		√			√				√	√												√		
	Integration of metabolism	√			√							√	√	√												√		
	Advanced biochemistry	√				√			√			√	√													√		
Thesis		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

# **Molecular Biology**

## Course specification of Molecular Biology

### **Course Specification:**

- Program on which the course is given: Master degree of pharmaceutical science.
- Major or minor Element of program: Major
- Department offering the program : Biochemistry department
- Department offering the course: Biochemistry department in conjunction with Microbiology department
- Date of specification approval: 2017/2018

### **1-Basic information:**

Title: Molecular biology

Code: M110

Lectures: 4 hrs/ week

Credit hrs: 4 hrs

Total: 4 hrs/week

### **2-Overall aim of the course:**

On completion of the course, the students will be able to:

- Outline principle information on DNA and RNA.
- Illustrate the basis of genetic engineering and its applications.

### 3- Intended learning outcomes (ILOs) of Molecular biology

<b>A-Knowledge and Understanding</b>	
<b>a1</b>	Outline principles of DNA structure, synthesis and sequencing.
<b>a2</b>	Illustrate RNA functions, protein synthesis and separation process.
<b>a3</b>	Summarize basis of genetic engineering, DNA cloning and PCR techniques.
<b>a4</b>	Identify the applications of genetic engineering in diagnosis and treatment of genetic diseases.
<b>B-Intellectual skills</b>	
<b>b1</b>	Apply molecular biology background to solve professional problems
<b>D- General and transferable skills</b>	
<b>d1</b>	Use computer skills as internet and power point in the activities.
<b>d2</b>	Gain information from various sources as text books, scientific journals, internet.....
<b>d3</b>	Search on various topics and write reports.

**4- Course Content of Molecular Biology**

Week No.	Lecture contents (4hrs/week)
1	<ul style="list-style-type: none"> <li>• DNA ,RNA structure, function.</li> <li>• Difference between DNA and RNA</li> </ul>
2	<ul style="list-style-type: none"> <li>• DNA replication steps</li> </ul>
3	<ul style="list-style-type: none"> <li>• Types of RNA</li> <li>• Genetic code</li> </ul>
4	<ul style="list-style-type: none"> <li>• Protein synthesis</li> <li>• Alteration of nucleotide sequence</li> </ul>
5	<ul style="list-style-type: none"> <li>• Genetic engineering</li> <li>• DNA cloning</li> <li>• Applications of cloning in treatment of diseases</li> <li>• Activity</li> </ul>
6	<ul style="list-style-type: none"> <li>• Genomic DNA libraries, c DNA</li> <li>• PCR, LCR and their applications</li> </ul>
7	<ul style="list-style-type: none"> <li>• RFLP</li> <li>• Linkage of polymorphism with gene mutation</li> <li>• Prenatal diagnosis, Diagnosis of sickle cell disease</li> <li>• Case studies</li> </ul>
8	<ul style="list-style-type: none"> <li>• Sequencing of DNA (chemical method)</li> </ul>
9	<ul style="list-style-type: none"> <li>• Sequencing of DNA (enzymatic method)</li> </ul>
10	<ul style="list-style-type: none"> <li>• Electrophoresis</li> </ul>
11	<ul style="list-style-type: none"> <li>• Sothern, western and northern blotting</li> </ul>
12	<ul style="list-style-type: none"> <li>• Sequencing of proteins</li> </ul>
13	<ul style="list-style-type: none"> <li>• Synthesis of genes</li> </ul>
14	<ul style="list-style-type: none"> <li>• Monoclonal antibodies + activity (reports)</li> </ul>
15	<ul style="list-style-type: none"> <li>• Revision and open discussion</li> </ul>

## **5- Teaching and learning methods:**

- Lectures
- Self learning
- Open discussion and presentations

## **6- Student assessment methods:**

Written exam assess: a1, a2, a3, a4

Oral exam assess: a1, a2, a3, a4, b1, d3

Activity assess: d1, d2, d3

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 4-15
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## **7- References and books:**

### **A- Scientific papers**

### **B- Essential books:**

- Richard A. Harvey and Denise R. Ferrier: Lippincott's illustrated reviews: Biochemistry 5<sup>th</sup> edition 2011. Lippincott Williams & Wilkins, a Wolters Kluwer businessm, Philadelphia.
- Robert F. Weaver: Molecular Biology 5<sup>th</sup> edition, 2012. The McGraw-Hill Science companies, Inc, New York, USA.

- Gupta P.K: Molecular Biology and genetic engineering: a textbook for University students, 1<sup>st</sup> edition, 2008. Rakesh Kumar Rastogi for Rastogi Publications, Newdelhi, India.

**C- Suggested books:**

- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. Biochemistry, 7<sup>th</sup> edition, 2012. WH Freeman and company, Newyork, USA.

**D- Websites:** pubmed, Sciencedirect, Nejm, Weilyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.

- 
- **Course Coordinators: Prof Dr/ Mohamed Mahmoud El-Seweidy and Prof. Dr. Fathy Serry**
  - **Head of Department: Prof Dr/ Sahar El-Swefy**



<b>Matrix I of Molecular Biology (2017-2018)</b>									
<b>Course Contents</b>		<b>ILOs of Molecular Biology course</b>							
		Knowledge and Understanding				Intellectual skills	General and transferable skills		
		<b>a1</b>	<b>a2</b>	<b>a3</b>	<b>a4</b>	<b>b1</b>	<b>d1</b>	<b>d2</b>	<b>d3</b>
<b>1</b>	• DNA ,RNA structure, function.	<b>x</b>	<b>X</b>						
	• Difference between DNA and RNA								
<b>2</b>	• DNA replication steps	<b>x</b>							
<b>3</b>	• Types of RNA		<b>X</b>						
	• Genetic code								
<b>4</b>	• Protein synthesis		<b>X</b>						
	• Alteration of nucleotide sequence								
<b>5</b>	• Genetic engineering								
	• DNA cloning								
	• Applications of cloning in treatment of diseases -activity			<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>x</b>	<b>X</b>
<b>6</b>	• Genomic DNA libraries, c DNA			<b>X</b>		<b>X</b>			

	• PCR, LCR and their applications								
<b>7</b>	• RFLP			<b>X</b>	<b>X</b>	<b>X</b>			
	• Linkage of polymorphism with gene mutation								
	• Prenatal diagnosis, Diagnosis of sickle cell disease								
<b>8</b>	• Sequencing of DNA (chemical method)	<b>x</b>							
<b>9</b>	• Sequencing of DNA (enzymatic method)	<b>x</b>							
<b>10</b>	• Electrophoresis	<b>x</b>							
<b>11</b>	• Sothern, western and northern blotting	<b>x</b>							
<b>12</b>	• Sequencing of proteins		<b>X</b>						
<b>13</b>	• Synthesis of genes	<b>x</b>							
<b>14</b>	• Monoclonal antibodies activity (reports)				<b>X</b>		<b>X</b>	<b>x</b>	<b>x</b>
<b>15</b>	• Revision and open discussion	<b>x</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>x</b>	<b>x</b>

### Matrix II of Molecular Biology (2017-2018)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.2- Mutual influence between professional practice and its impact on the environment.	A-2-Outline principle information on DNA and RNA , biotechnology and cell culture, recent medical biotechnology applications	a1- a2- a3- a4	<ul style="list-style-type: none"> <li>DNA structure, function.</li> <li>DNA replication steps -</li> <li>Genomic DNA libraries, c</li> <li>DNA -Sequencing of DNA (chemical method)-</li> <li>Sequencing of DNA (enzymatic method)-</li> <li>Electrophoresis- Sothern, western and northern blotting- Synthesis of genes- RNA structure, function.- Difference between DNA and RNA- Types of RNA- Genetic code- Protein synthesis- Alteration of nucleotide sequence - Sequencing of proteins- Genetic engineering- DNA cloning- PCR, LCR and their applications- RFLP- Linkage of polymorphism with gene mutation- Applications of cloning in treatment of diseases-</li> </ul>	Textbooks, Scientific papers and self learning	x	x	x	x	

				Prenatal diagnosis, Diagnosis of sickle cell disease- Monoclonal antibodies						
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.7- Discuss principles and fundamentals of quality of professional practice in the field of biochemistry & molecular biology	a3- a4	Genetic engineering- DNA cloning- PCR, LCR and their applications- RFLP- Linkage of polymorphism with gene mutation- Applications of cloning in treatment of diseases- Prenatal diagnosis, Diagnosis of sickle cell disease- Monoclonal antibodies	Textbooks, Scientific papers and self learning	x	x	x	x	
Intellectual skills	2.2.2- Solve specified problems in the lack or missing of some information.	B-4- Suggest significant solutions for biochemical results and outcome errors based on a wide academic background.	b1	Genetic engineering- DNA cloning- PCR, LCR and their applications- RFLP- Linkage of polymorphism with gene mutation- Applications of cloning in treatment of diseases- Prenatal diagnosis, Diagnosis of sickle cell disease- Monoclonal antibodies	Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity (reports)- open discussion	Textbooks, Scientific papers and self learning	x	x			X

	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Activity (reports)- open discussion	Textbooks, Scientific papers and self learning	x	x			X
	2.4.8- Continuous and self learning.	D.8- Study independently and plan research studies.	d4	Activity (reports)- open discussion	Textbooks, Scientific papers and self learning	x	x		x	X

# **Biotechnology**

## Course specification of Biotechnology

### A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or minor element of programs:** Major
- **Department offering the program:** Microbiology and Immunology
- **Department offering the course:** Microbiology and Immunology department in conjunction with Biochemistry department
- **Date of specification approval:** 2017/2018

### 1-Basic Information:

Title: Biotechnology

Code: ME4

Credit hours: 4hrs/week

Lectures: 4hrs/week

Total: 4hrs/week

### 2- Overall aims of the course:

On completion of the course, the student will be able to describe the components of biotechnology, the exploitation of gene cloning and recombinant DNA technology in production of useful microbial industrial strains and in monoclonal antibody technology, apply conventional genetic approaches and molecular genetics approaches in biotechnology,

explain the bases of molecular genetics, and basic gene cloning strategies and tools and explore the basis of stem cell biotechnology and the regenerative medicine.

### **3-Intended learning outcomes (ILOS) of Biotechnology:**



<b>A- Knowledge and Understanding</b>	
<b>a1</b>	Outline the principles of biotechnology techniques.
<b>a2</b>	Explain how to manage and exploit knowledge of DNA cloning, recombinant DNA, and applied technology.
<b>a3</b>	Summarize recent medical biotechnology applications.
<b>a4</b>	Identify the principles of stem cell biotechnology and regenerative medicine.
<b>B- Intellectual skills</b>	
<b>b1</b>	Express the principles biotechnology in medicine, agriculture and pollution control.
<b>b2</b>	Associate the principles of recombinant DNA technology in gene cloning and assessment of the microbial transformation
<b>b3</b>	Discuss the principles of PCR technology in the assessment of microbial mutation, gene detection, gene sequencing and forensic medicine
<b>D- General and transferable skills</b>	
<b>d1</b>	Use computer skills as internet and power point in the activities.
<b>d2</b>	Gain information from various sources as text books, scientific journals, internet,...etc.
<b>d3</b>	Search on various topics and write reports or term papers.
<b>d4</b>	Work as a member in a team and communicate effectively with the other members of the team

**4-Course content of Biotechnology:**

<b>Week number</b>	<b>Lecture content (2 hrs/week) (Microbiology Department)</b>	<b>Lecture content (2 hrs/week) (Biochemistry Department)</b>
<b>1</b>	Introduction to biotechnology	Pharmacokinetics and pharmacodynamics of peptides and protein drugs  a- Elementation of protein therapeutics  b- Distribution of protein therapeutics
<b>2</b>	DNA Recombination:  • Naturally occurring genetic recombination  • Artificially occurring genetic recombination (in laboratory)	Pharmacokinetics and pharmacodynamics of peptides and protein Drugs  c- Protein binding of protein  d- Chemical modification of protein therapeutics
<b>3</b>	Requirements for genetic engineering	Hematopoietic Growth Factor  a- Chemical description  b- Pharmaceutical concerns  c- Clinical and practice aspects  d- Toxicities
<b>4</b>	Gene Cloning:  • General strategy for gene cloning  • Obtaining the target genes	INTERLEUKINS  a- Interleukins 1-17  b- Introduction and chemical Description – Pharmacology

5	<p>Gene Cloning:</p> <ul style="list-style-type: none"> <li>• Finding suitable cloning vectors</li> <li>• Joining target gene(s) to the vector</li> <li>• Insertion of hybrid (recombinant) DNA into the expression of host (transformation) and selection of the transformant</li> </ul>	<p>INTERLEUKINS</p> <p>c- Interferon's alpha , Beta , Gamma</p> <p>d- Pharmaceutical concerns</p> <p>e- Clinical and Practice aspects</p>
6	<p>Applications of genetic engineering</p> <p><b>Activity</b></p>	<p>INSULIN</p> <p>a- Introduction</p> <p>b- Pharmacology and Formulations</p> <p>c- Pharmaceutical concerns, chemical and physical stabilities</p> <p>d- Clinical and practice aspects</p> <p><b>Activity</b></p>
7	<p>Polymerase chain reaction (PCR)</p> <p>Types of PCR</p> <ul style="list-style-type: none"> <li>• Traditional PCR</li> <li>• rt PCR</li> <li>• Real time PCR</li> <li>• rt real time PCR</li> </ul>	<p>Growth hormones</p> <p>a- hGH structure , Isolation</p> <p>b- Pharmacology</p>
8	<p>Applications of PCR:</p>	<p>Growth hormones</p>

	<p>1- gene amplification for:</p> <ul style="list-style-type: none"> <li>• gene cloning</li> <li>• gene sequencing</li> <li>• gene control drug production</li> </ul> <p>2- diagnosis of microbial infections</p> <p>3- in forensic medicine</p>	<p>c- Protein manufacture , formulations</p> <p>d- Clinical use</p>
<b>9</b>	<p>Monoclonal antibody (MAb) technology (synthesis of Ab in laboratory):</p> <ul style="list-style-type: none"> <li>• hybridoma technology</li> <li>• production and selection of Ab</li> <li>• types of genetically engineered MAb (mouse, chimeric, humanized, human)</li> <li>• nomenclature of MAb according to the target and source</li> <li>• Global Marketing pharmaceutically useful MAb</li> </ul>	<p>Dispensing Biotechnology products</p> <p>a- Introduction – Storage</p> <p>b- Handling</p> <p>c- Preparations</p>
<b>10</b>	<p>Stem cells technology:</p> <ul style="list-style-type: none"> <li>• Types of stem cells</li> <li>• Isolation</li> <li>• Culturing</li> </ul>	<p>Dispensing Biotechnology products</p> <p>d- Administration</p> <p>e- Outpatient/Homecare use</p> <p>f- Patient assessment</p>

	<ul style="list-style-type: none"> <li>• Applications of stem cells technology in regenerative medicine</li> </ul>	
11	Advances in vaccine preparation	Biotechnology for pharmaceutical products  a- Hormones  b- Preparation of vaccines and other biological products
12	Gene sequencing	Biotechnology for pharmaceutical products  c- Old , modern Biotechnology  d- Applications in Medicine- industry – Agriculture – Ecology
13	Microarray technology	PCR , LCR ,applications in forensic medicine- Mutations- RFLP.....etc
14, 15	Presentation of students activities and open discussion	

### **5-Teaching and Learning Methods:**

- Lectures
- Self learning
- Open discussion and presentations
- Critical thinking

### **6-Student Assessment methods:**

- Written exams to assess: a1, a2, a3, a4, b1, b2, b3
- Oral exam to assess: a1, a2, a3, a4, b1, b2, b3

- 
- Activity to assess: d1, d2, d3, d4

**Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 6,14,15
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7-References &books:****A- Scientific papers****B- Essential books:**

1. Crommelin, D.A.; and Sindeler, R.D. (1997). Pharmaceutical Biotechnology. Hartwood Academic Publishers. The Netherlands.

- 
2. Glick, B.P.; and Pasterternak, J.J. (1994). Molecular Biotechnology- Principles Applications of recombinant DNA. AS Press, Washington, D.C., USA.
  3. Thieman, W.J.; Palladino, M.A. (2008). *Introduction to Biotechnology*. Pearson/Benjamin Cummings. ISBN 0-321-49145-9.
  4. Higuchi, R., Dollinger, G., Walsh, P.S. & Griffith, R. (1992) Simultaneous amplification and detection of specific DNA sequences. *Biotechnology*, 10, 413–417. [The first description of real-time PCR].
  5. VanGuilder, H.D., Vrana, K.E. & Freeman, W.M. (2008) Twenty-five years of quantitative PCR for gene expression analysis. *Biotechniques*, 44, 619–624.

**C- Suggested books:**

1. Biotechnology in health care: an introduction to biopharmaceuticals
2. Ermak G., (2013), Modern Science & Future Medicine (second edition)

**D- Websites:** pubmed, Science direct, Nejm, Weilyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.
- 

- **Course Coordinators: Prof. Dr/ Ashraf Ahmed Kadry**

**Prof. Dr/ Mohammed El-Sewedy**

- **Head of Department: Prof. Dr/ Nehal Elsayed**

<b>Matrix I of Biotechnology (2017-2018)</b>								
<b>Course Contents</b>		<b>ILOs of Biotechnology course</b>						
		Knowledge and Understanding			Intellectual skills	General and transferable skills		
		a1	a2	a3	b1	d1	d2	d3
<b>1</b>	Introduction to biotechnology	x						
<b>2</b>	Bioprocess	x						
<b>3</b>	Downstream processing	x						
<b>4</b>	Cell culture - Activity	x				x	x	X
<b>5</b>	Hybridoma technology	x						
<b>6</b>	Medical biotechnology			x	x			
<b>7</b>	Medicine from cultured cells			x	x			
<b>8</b>	DNA Recombination & Application of genetic engineering		X	x	x			
<b>9</b>	Principle of PCR technology and gene amplification.	x	X					
<b>10</b>	Applications and advances in PCR			x	x			
<b>11</b>	Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of MABs				x			
<b>12</b>	Global Marketing Pharmaceutically useful monoclonal antibodies			x	x			
<b>13</b>	Applications and advances in PCR			x	x			
<b>14</b>	<ul style="list-style-type: none"> <li>• Vaccine preparations</li> <li>• Stem cells technology &amp;</li> <li>• Regenerative medicine.</li> <li>• Activity (presentation of reports)</li> </ul>			x	x	x	x	X
<b>15</b>	• Revision and open discussion	x	X	x	x	x	x	X





Matrix II of Biotechnology (2017-2018)										
ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.2- Mutual influence between professional practice and its impact on the environment.	A-2-Outline principle information on DNA and RNA , biotechnology and cell culture, recent medical biotechnology applications	a1- a2- a3	Introduction to biotechnology- Bioprocess- Downstream processing- Cell culture- Hybridoma technology- Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Principle of PCR technology and gene amplification.- Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	Textbooks, Scientific papers and self learning	x	X	x	x	

Intellectual skills	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B-3-Correlate the knowledge of different biochemical aspects to solve health problems	b1	Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.	d1	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	X			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	X			x
	2.4.8- Continuous and self learning.	D.8- Study independently and plan research studies.	d4	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	X		x	x
General and transferable skills										

# **Special Courses**

# Metabolism of Individual Tissues

---

## Course specification of Metabolism of individual tissues

### A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept
- Date of specification approval: 2017/2018

### 1- Basic information:

Title: <b>Metabolism of individual tissues</b>	Code: BSp1
Lectures: 4 hrs/week	Credit hours: 4 hrs/week
Total: 4 hrs/week	

### 1- Overall aim of the course:

On completion of the course, the students will be able to:

- Illustrate principles of tissue metabolism.
- Outline abnormalities relevant to tissue metabolism
- Integrate metabolism background to identify clinical problems and interpret scientific results.

**3. Intended learning outcome s (ILOs) of Metabolism of individual tissues:**

<b>A- Knowledge and Understanding</b>	
<b>a1</b>	Outline control mechanisms of metabolism.
<b>a2</b>	Describe metabolic roles and pathways in different organs.
<b>a3</b>	Identify the correlation between environmental changes and metabolism.
<b>a4</b>	Illustrate up to date diagnosis of metabolic disorders.
<b>B- Intellectual skills</b>	
<b>b1</b>	Integrate and link metabolic background to determine metabolic abnormalities.
<b>b2</b>	Correlate the knowledge of different biochemical aspects to solve health problems.
<b>D- General and transferable skills</b>	
<b>d1</b>	Use computer skills as internet and power point in the activities.
<b>d2</b>	Gain information from various sources as text books, scientific journals, internet.....
<b>d3</b>	Work effectively as a member of a team.
<b>d4</b>	Search on various topics and write reports.

**4. Course Content of Metabolism of individual tissues**

<b>Week No.</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	High energy compounds.
<b>2</b>	<ul style="list-style-type: none"><li>• Major metabolic control mechanisms.<ul style="list-style-type: none"><li>- Control of enzyme levels.</li><li>- Control of enzyme activity.</li></ul></li><li>• Activity</li></ul>
<b>3</b>	<ul style="list-style-type: none"><li>• Major metabolic control mechanisms.<ul style="list-style-type: none"><li>- Compartmentation.</li><li>- Hormonal regulation.</li></ul></li></ul>
<b>4</b>	<ul style="list-style-type: none"><li>• Receptors in the tissues.</li></ul>
<b>5</b>	<ul style="list-style-type: none"><li>• Metabolic roles of organs<ul style="list-style-type: none"><li>- Liver - Kidney</li></ul></li></ul>
<b>6</b>	<ul style="list-style-type: none"><li>• Metabolic roles of organs<ul style="list-style-type: none"><li>- Brain – Heart</li></ul></li></ul>
<b>7</b>	<ul style="list-style-type: none"><li>• Metabolic roles of organs<ul style="list-style-type: none"><li>Adipose tissue - Locomotor system (muscle- bone)</li></ul></li></ul>
<b>8</b>	<ul style="list-style-type: none"><li>• Abnormalities in these tissues.</li></ul>
<b>9</b>	<ul style="list-style-type: none"><li>• Abnormalities in these tissues.</li></ul>
<b>10</b>	<ul style="list-style-type: none"><li>• Biochemical and non biochemical diagnosis of metabolic abnormalities.</li></ul>
<b>11</b>	<ul style="list-style-type: none"><li>• Open discussion for some case studies.</li></ul>
<b>12</b>	<ul style="list-style-type: none"><li>• Activity (presentation of review articles)</li></ul>
<b>13</b>	<ul style="list-style-type: none"><li>• Metabolic effect of smoking and malnutrition.</li></ul>
<b>14</b>	<ul style="list-style-type: none"><li>• Effect of environment on metabolism.<ul style="list-style-type: none"><li>- Heavy metals</li><li>- Radiation</li></ul></li></ul>



	- Insecticides
15	• Revision and open discussion

### **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- Open discussion and presentations

### **6- Student Assessment methods:**

Written exams assess: a1, a2, a3, a4, b1, b2

Oral exam assess: a1, a2, a3, a4, b1, b2, d4

Activity assess: d1, d2, d3, d4

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 2-12
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

### **7- References and books:**

**A-Scientific papers**

**B- Essential books:**

- 
- Lippincott's illustrated reviews: Biochemistry 5<sup>th</sup> edition 2011 by Richard A. Harvey and Denise R. Ferrier, Lippincott Williams & Wilkins, a Wolters Kluwer businessm, Philadelphia.
  - Biochemistry, 2<sup>nd</sup> edition, Mathews, van Holde.
  - Biochemistry, fifth edition, 2002, Jereny M. Berg, John L. Tymoczko, Lubert Stryer.

**C- Suggested books:**

- Fundamentals of biochemistry upgrade edition, 2002, Donald Voet, Judith G. Voet, Charlotte W. Pratt.

**D- Websites:** pubmed, Sciencedirect, Nejm, Weilyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.

- 
- **Course Coordinators:** Prof Dr/ Hoda El-Sayed
  - **Head of Department:** Prof Dr/ Sahar El-Swefy
  - **Date:** 2017 تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ

<b>Matrix I of Metabolism of individual tissues (2017-2018)</b>											
<b>Course Contents</b>		<b>ILOs of Metabolism of individual tissues course</b>									
		Knowledge and understanding				Intellectual skills		General and Transferable skills			
		a1	a2	a3	a4	b1	b2	d1	d2	d3	d4
<b>1</b>	High energy compounds.	X									
<b>2</b>	<ul style="list-style-type: none"> <li>Major metabolic control mechanisms.</li> <li>- Control of enzyme levels.</li> <li>- Control of enzyme activity.</li> <li>Activity</li> </ul>	X						x	X	X	x
<b>3</b>	<ul style="list-style-type: none"> <li>Major metabolic control mechanisms.</li> <li>- Compartmentation.</li> <li>- Hormonal regulation.</li> </ul>	X									
<b>4</b>	<ul style="list-style-type: none"> <li>Receptors in the tissues.</li> </ul>	X									
<b>5</b>	<ul style="list-style-type: none"> <li>Metabolic roles of organs</li> <li>- Liver – Kidney</li> </ul>		X								
<b>6</b>	<ul style="list-style-type: none"> <li>Metabolic roles of organs</li> <li>- Brain – Heart</li> </ul>		X								
<b>7</b>	<ul style="list-style-type: none"> <li>Metabolic roles of organs</li> </ul>		X								

	- Adipose tissue - Locomotor system (muscle- bone)										
8	• Abnormalities in this tissues.					x					
9	• Abnormalities in this tissues.					x					
10	• Biochemical and non biochemical diagnosis of metabolic abnormalities.				x		x				
11	• Open discussion for some case studies.			x							
12	• Activity (presentation of review articles)							x	X	X	x
13	• Metabolic effect of smoking and malnutrition.						x				
14	• Effect of environment on metabolism. - Heavy metals - Radiation - Insecticides			X			x				
15	• Revision and open discussion	X	X	X	x	x	x	x	X	X	x

### Matrix II of Metabolism of individual tissues (2017-2018)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A-1-Build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions	a2	<ul style="list-style-type: none"> <li>Metabolic roles of organs</li> <li>- Liver - Kidney- Brain- Heart- Adipose tissue- Locomotor system (Muscle-bone)</li> </ul>	Textbooks, Scientific papers and self learning	X	x	x	x	
		A.8-Explain pharmacotherapeutic properties of different groups of drugs, mechanism of action, drug-drug interaction, toxic effects and risks and benefits of commonly used drugs.	a3	<ul style="list-style-type: none"> <li>Effect of environment on metabolism (Heavy metals- Radiation- Insecticides)- Open discussion for some case studies</li> </ul>	Textbooks, Scientific papers and self learning	X	x	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.3-Illustrate principles of tissue metabolism, abnormalities relevant to tissue metabolism	a1- a2- a3	High energy compounds- • Major metabolic control mechanisms (Control of enzyme levels-Control of enzyme activity- Compartmentation- Hormonal regulation)- Receptors in the tissues- Metabolic roles of organs - Liver - Kidney- Brain- Heart- Adipose tissue- Locomotor system (Muscle-bone)	Textbooks, Scientific papers and self learning	X	x	x	x	

		A.5- Apply clinical biochemistry & molecular biology in diagnosis of metabolic disorder (tumor and inflammatory , oxidative stress , changes associated with geriatric and pediatric )	a4	Biochemical and non biochemical diagnosis	Textbooks, Scientific papers and self learning	X	x	x	x	
Intellectual skills	2.2.2- Solve specified problems in the lack or missing of some information.	B-4- Suggest significant solutions for biochemical results and outcome errors based on a wide academic background.	b1	Abnormalities in studied tissues	Textbooks, Scientific papers and self learning	X	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B-3-Correlate the knowledge of different biochemical aspects to solve health problems	b2	Biochemical and non biochemical diagnosis- Metabolic effect of smoking and malnutrition- Effect of environment on metabolism (Heavy metals- Radiation- Insecticides)	Textbooks, Scientific papers and self learning	X	x	x	x	
General and transferable skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.	d1	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	X	x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	X	x			x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.	d3	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	X	x			x
	2.4.8- Continuous and self learning.	D.8- Study independently and plan research studies.	d4	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	X	x		x	x

# Integration of Metabolism

## Course specification of Integration of Metabolism

### Course specifications:

- Program (s) on which the course is given: Master of Pharmaceutical Sciences (Biochemistry)
- Major or Minor element of programs: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept.
- Date of specification approval: 2018/2019

### 1- Basic information:

Title: Integration of metabolism

Code: BSp3

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4hrs/week

### 2-Overall aim of the course:

On completion of the course, the students will be able to:

- Illustrate interconnected metabolic pathways.
- Outline principles of metabolic adaptation
- Link metabolic pathways to the abnormalities that may rise.



### 3. Intended learning outcome s (ILOs) of Integration of metabolism

<b>A-Knowledge and Understanding</b>	
<b>a1</b>	Outline interconnected pathways of metabolism.
<b>a2</b>	Identify the regulation of metabolic pathways.
<b>a3</b>	Demonstrate metabolic changes during fed/ fasting cycle and diseases.
<b>a4</b>	Illustrate some nutritional aspects.
<b>B-Intellectual skills</b>	
<b>b1</b>	Solve some health problems based on academic knowledge.
<b>b2</b>	Analyze and interpret biochemical data related to metabolic changes during fed/ fasting cycle and diseases.
<b>D- General and transferable skills</b>	
<b>d1</b>	Use computer skills as internet and power point in the activities.
<b>d2</b>	Gain information from various sources as text books, scientific journals, internet.....
<b>d3</b>	Search on various topics and write reports.

### 4. Course Content of Integration of metabolism

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	<ul style="list-style-type: none"><li>• Overview of the major metabolic pathways</li></ul>
<b>2</b>	<ul style="list-style-type: none"><li>• Interconnected pathways</li></ul>
<b>3</b>	<ul style="list-style-type: none"><li>• Fed fasting cycle</li></ul>
<b>4</b>	<ul style="list-style-type: none"><li>• Effect of hormones on individual metabolic pathways</li></ul>
<b>5</b>	<ul style="list-style-type: none"><li>• Fuel choice during exercise</li></ul>

<b>6</b>	<ul style="list-style-type: none"> <li>Ethanol alters metabolism</li> </ul>
<b>7</b>	<ul style="list-style-type: none"> <li>Activity (review article)</li> </ul>
<b>8</b>	<ul style="list-style-type: none"> <li>Obesity</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>Obesity and case studies</li> </ul>
<b>10</b>	<ul style="list-style-type: none"> <li>Diabetes mellitus</li> </ul>
<b>11</b>	<ul style="list-style-type: none"> <li>Nutrition: nutritional consideration for specified individuals</li> </ul>
<b>12</b>	<ul style="list-style-type: none"> <li>Nutrition: Drug - nutrient interaction</li> </ul>
<b>13</b>	<ul style="list-style-type: none"> <li>Nutrition: Diet linked diseases + case studies</li> </ul>
<b>14</b>	<ul style="list-style-type: none"> <li>Final term oral presentation</li> </ul>
<b>15</b>	<ul style="list-style-type: none"> <li>Revision and open discussion</li> </ul>

### **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- Open discussion and presentations

### **6- Student Assessment methods:**

- Written exams assess: a1, a2, a3, a4, b1, b2
- Oral exam assess: a1, a2, a3, a4, b1, b2 and d3
- Activity assess: d1, d2 and d3

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 7-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7- References and books:****A- Handouts****B- Essential books:**

- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. Biochemistry, 7<sup>th</sup> edition, 2012. WH Freeman and company, Newyork, USA.
- Richard A. Harvey and Denise R. Ferrier: Lippincott's illustrated reviews: Biochemistry 5<sup>th</sup> edition 2011. Lippincott Williams & Wilkins, a Wolters Kluwer businessm, Philadelphia.

**C- Suggested books:**

**D- Websites:** pubmed, Sciencedirect, Nejm, Weilyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, Computer, data show.

- 
- **Course Coordinators:** Prof Dr/ Mervat Asker
  - **Head of Department:** Prof Dr/ Sahar El-Swefy
  - **Date:** تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ 2017

<b>Matrix I of Integration of Metabolism (2017-2018)</b>										
<b>Course Contents</b>		<b>ILOs of Integration of Metabolism course</b>								
		Knowledge and understanding				Intellectual skills		General and transferable skills		
		a1	a2	a3	a4	b1	b2	d1	d2	d3
1	• Overview of the major metabolic pathways	X								
2	• Interconnected pathways	X								
3	• Fed fasting cycle			x			x			
4	• Effect of hormones on individual metabolic pathways		x							
5	• Fuel choice during exercise		x							
6	• Ethanol alters metabolism		x							
7	• Activity (review article)							X	x	X
8	Obesity			x			x			
9	Obesity and case study			x		x	X			
10	Diabetes mellitus			x						
11	• Nutrition: nutritional consideration for specified individuals				x	x				
12	• Nutrition: Drug- nutrient interaction				x					
13	• Nutrition: Diet linked diseases + case studies				x	x				
14	• Final term oral presentation							X	x	X
15	• Revision and open discussion	X	x	x	x	x	X	X	X	x

Matrix II of Integration of metabolism (2017-2018)										
ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A-1-Build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions	a3	Fed fasting cycle- Obesity-Obesity and case studies- Diabetes mellitus	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.4-Evaluate interconnected metabolic pathways, metabolic adaptation and link metabolic pathways to the abnormalities expected.	a1- a2- a3- a4	Overview of the major metabolic pathways- Interconnected pathways- Effect of hormones on individual metabolic pathways- Fuel choice during exercise- Ethanol alters metabolism - Fed fasting cycle- Obesity- Obesity and case studies- Diabetes mellitus- Nutrition: nutritional consideration for specified individuals- Drug - nutrient interaction- Diet linked	Textbooks, Scientific papers and self learning	x	x	x	x	

				diseases + case studies						
Intellectual skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B-2- Analyze statistically and interpret biochemical and molecular laboratory data obtained from experiments in different forms.	b2	Fed fasting cycle-Obesity	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.2.2- Solve specified problems in the lack or missing of some information.	B-4- Suggest significant solutions for biochemical results and outcome errors based on a wide academic background.	b1	Obesity and case studies- Nutrition: nutritional consideration for specified individuals- Diet linked diseases + case studies	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B-3- Correlate the knowledge of different biochemical aspects to solve health problems	b1	Obesity and case studies- Nutrition: nutritional consideration for specified individuals- Diet linked diseases + case studies	Textbooks, Scientific papers and self learning	x	X	x	x	
General and transferable skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.	d1	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	x	X			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	x	X			x
	2.4.8- Continuous and self learning.	D.8- Study independently and plan research studies.	d3	Activities and presentation of review articles	Textbooks, Scientific papers and self learning	x	X			x

# **Advanced Biochemistry**

## Course specification of Advanced Biochemistry

### Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept.
- Date of specification approval: 2017/2018

### 1- Basic information:

Title: Advanced biochemistry

Code: BSp2

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4hrs/week

### 2-Overall aim of the course:

On completion of the course, the students will be able to

- Outline clinical significance of tumor and inflammatory markers
- Focus on clinical chemistry of geriatrics and pediatrics
- Correlate the relation between disturbance in body fluids and various health problems



### 3. Intended learning outcome s (ILOs) of Advanced

#### Biochemistry:

<b>A-Knowledge and Understanding</b>	
<b>a1</b>	Illustrate tumor and inflammatory markers and demonstrate their clinical significance.
<b>a2</b>	A8
<b>a3</b>	Discuss clinical chemistry of geriatric and pediatric patients.
<b>a4</b>	Recognize the source, physiologic purpose and clinical utility of laboratory measurements for body fluids.
<b>B-Intellectual skills</b>	
<b>b1</b>	Analyze and interpret laboratory measurements for tumor and inflammatory markers and body fluids.
<b>b2</b>	Correlate changes in extreme ages to manage their health problems.
<b>D- General and transferable skills</b>	
<b>d1</b>	Use computer skills as internet and power point in the activities.
<b>d2</b>	Gain information from various sources as text books, scientific journals, internet.....
<b>d3</b>	Work effectively as a member of a team.

**4. Course Content of Advanced Biochemistry:**

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	• Metabolic aspects of malignant diseases
<b>2</b>	• Factors induced carcinogenesis (drugs- pollution) Tumor markers (types and applications)
<b>3</b>	• Tumor markers (detection and frequently ordered tumor markers)
<b>4</b>	Oxidative stress
<b>5</b>	Inflammation (sources- causes- mechanism) Inflammatory markers
<b>6</b>	Inflammatory markers Anti-inflammatory drugs
<b>7</b>	Midterm oral presentations
<b>8</b>	Clinical chemistry of geriatric patients Biochemical and physiologic changes of aging
<b>9</b>	Clinical chemistry results of aging
<b>10</b>	• Clinical chemistry of pediatric patients - Childhood disorders
<b>11</b>	• Case studies
<b>12</b>	• Body fluids - Amniotic fluids- Cerebrospinal fluid
<b>13</b>	• Body fluids - Synovial fluid- Serous fluids
<b>14</b>	• Final term oral presentations
<b>15</b>	• Revision and Open discussion

## **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- Open discussion and presentations

## **6- Student Assessment methods:**

Written exams assess: a1, a2, a3, a4, b1 and b2

Oral exam assess: a1, a2, a3, a4, b1 and b2

Activity assess: d1, d2 and d3

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 7-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## **7- References and books:**

### **A- Scientific papers.**

### **B- Essential books:**

- Bishop clinical chemistry, sixth edition, 2010, Michael L Bishop, Edward P Fody, Larry E Schoeff
- Clinical Chemistry, fifth edition, 2004, William J Marshall, Stephen K Bangert

**c- Websites:** pubmed, Sciencedirect, Nejm, Wileyinterscience

### **Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.

- **Course Coordinators: Prof Dr/ Sousou Ibrahim**
- **Head of Department: Prof Dr/ Sahar El-Swefy**
- **Date: 2017 تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ**

<b>Matrix I of Advanced biochemistry (2017-2018)</b>										
<b>Course Contents</b>		<b>ILOs of Advanced biochemistry course</b>								
		Knowledge and understanding				Intellectual skills		General and transferable skills		
		a1	a2	a3	a4	b1	b2	d1	d2	d3
1	• Metabolic aspects of malignant diseases	x								
2	• Factors induced carcinogenesis (drugs- pollution) Tumor markers (types and applications)	x	x			x				
3	• Tumor markers (detection and frequently ordered tumor markers)	x				X				
4	Oxidative stress	x				X				
5	Inflammation (sources- causes- mechanism) Inflammatory markers	x	x			X				
6	Inflammatory markers Anti-inflammatory drugs	x	x			X				
7	Midterm oral presentations							X	X	X
8	Clinical chemistry of geriatric patients Biochemical and physiologic changes of aging			x			X			
9	Clinical chemistry results of aging			X			x			
10	• Clinical chemistry of pediatric patients - Childhood disorders			x			x			
11	• Case studies							X	X	X
12	• Body fluids - Amniotic fluids- Cerebrospinal fluid				x	X				
13	• Body fluids - Synovial fluid- Serous fluids				x	X				
14	• Final term oral presentations							x	X	x
15	• Revision and Open discussion							x	X	X

### Matrix II of Advanced Biochemistry (2017-2018)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A-1-Build up comprehensive knowledge on the overall mammalian physiological functions of the different body organs as well as certain abnormal conditions	a4	<ul style="list-style-type: none"> <li>• Body fluids</li> <li>- Amniotic fluids-</li> <li>Cerebrospinal fluid-</li> <li>Synovial fluid- Serous fluids</li> </ul>	Textbooks, Scientific papers and self learning	x	x	x	x	
		A.8-Explain pharmacotherapeutic properties of different groups of drugs, mechanism of action, drug-drug interaction, toxic effects and risks and benefits of commonly used drugs.	a2	<ul style="list-style-type: none"> <li>• Factors induced carcinogenesis (drugs-pollution...)</li> <li>• Tumor markers (types and applications)-</li> <li>• Inflammation (sources-causes- mechanisms...)</li> <li>• Inflammatory markers</li> <li>• Anti-inflammatory drugs</li> </ul>	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.5- Apply clinical biochemistry & molecular biology in diagnosis of metabolic disorder (tumor and inflammatory , oxidative stress , changes associated with geriatric and pediatric )	a1- a3- a4	<ul style="list-style-type: none"> <li>• Metabolic aspects of malignant diseases- • Factors induced carcinogenesis (drugs- pollution...)</li> <li>• Tumor markers (types and applications)- • Tumor markers (detection and frequently ordered tumor markers)</li> <li>• Oxidative stress</li> <li>• Inflammation (sources- causes- mechanisms...)</li> <li>• Inflammatory markers</li> <li>• Anti-inflammatory drugs</li> <li>• Clinical chemistry of geriatric patients</li> <li>• Biochemical and physiologic changes of aging• Clinical chemistry results of aging• Clinical chemistry of pediatric patients- Childhood disorders• Body fluids - Amniotic fluids- Cerebrospinal fluid- Synovial fluid- Serous fluids</li> </ul>	Textbooks, Scientific papers and self learning	x	x	x	x	
--	---	--	------------	--	--	---	---	---	---	--

Intellectual skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B-2- Analyze statistically and interpret biochemical and molecular laboratory data obtained from experiments in different forms.	b1	<ul style="list-style-type: none"> <li>• Factors induced carcinogenesis (drugs-pollution...)</li> <li>• Tumor markers (types and applications)-</li> <li>• Tumor markers (detection and frequently ordered tumor markers)</li> <li>• Oxidative stress</li> <li>• Inflammation (sources-causes- mechanisms...)</li> <li>• Inflammatory markers</li> <li>• Anti-inflammatory drugs</li> </ul> Body fluids - Amniotic fluids- Cerebrospinal fluid- Synovial fluid- Serous fluids	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B-3-Correlate the knowledge of different biochemical aspects to solve health problems	b2	Clinical chemistry of geriatric patients <ul style="list-style-type: none"> <li>• Biochemical and physiologic changes of aging</li> <li>• Clinical chemistry results of aging</li> <li>• Clinical chemistry of pediatric patients- Childhood disorders</li> </ul>	Textbooks, Scientific papers and self learning	x	x	x	x	



	2.2.6- Plan to improve performance in the field of specialization.	B-7- Evaluate various therapeutic strategies for individuals with high risk for disease and common medical conditions as well as the toxicity resulting from therapy	b1	<ul style="list-style-type: none"> <li>• Factors induced carcinogenesis (drugs-pollution...)</li> <li>• Tumor markers (types and applications)-</li> <li>• Tumor markers (detection and frequently ordered tumor markers)</li> <li>• Oxidative stress</li> <li>• Inflammation (sources-causes- mechanisms...)</li> <li>• Inflammatory markers</li> <li>• Anti-inflammatory drugs</li> </ul> Body fluids - Amniotic fluids- Cerebrospinal fluid- Synovial fluid- Serous fluids	Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills such as internet, word processing, SPSS and data sheet.	d1	Oral presentations- case studies	Textbooks, Scientific papers and self learning	x	x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from various sources in the field of biochemistry.	d2	Oral presentations- case studies	Textbooks, Scientific papers and self learning	x	x			x
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.	d3	Oral presentations- case studies	Textbooks, Scientific papers and self learning	x	x			x

# Thesis Specification

---

## Thesis of Master Degree

### **A- Thesis specifications:**

- **Program on which the course is given:** Master of Pharmaceutical sciences (Biochemistry)
- **Major or Minor element of program:** Major
- **Department offering the program:** Biochemistry Dept.
- **Department offering the thesis:** Biochemistry Dept.
- **Date of specification approval:** 2017/2018

### **1- Basic information:**

Title: Master Thesis in Biochemistry

Credit hours: 30 hrs

### **2- Overall aim of the thesis:**

After being accepted by the Faculty authority, the candidate has to recall the research plan of the University and the Faculty to select the research area which he/she is going to fit with

#### **On completion of the thesis, the students will be able to:**

- Design a robust study to answer the research question
- Identify and perform different techniques and methods used in the experimental work according to the designed protocol
- Collect all the data needed to answer the research question using the developed study design
- Analyze the results of the study in the light of prior knowledge

- 
- Draw conclusions about the contribution to knowledge made by the study.

### **3- Intended learning outcome's (ILOs):**

<b>Knowledge and Understanding</b>	
<b>a1</b>	Outline theoretical and advanced bases of biochemistry and biology related to main objectives of the thesis
<b>a2</b>	Determine the problem the thesis will handle in correlation with the community and surrounding environment
<b>a3</b>	Explain clearly the principles of some biochemical and analytical techniques
<b>a4</b>	Understand any legal aspects related to the thesis work.
<b>a5</b>	Demonstrate GLP and quality assurance related to practical work of the thesis
<b>a6</b>	Identify and apply scientific experimental ethics.
<b>Intellectual skills</b>	
<b>b1</b>	Solve problems related to practical work by obtained quantitative data from the practical work
<b>b2</b>	Discuss professional problems and suggest solutions relay on different pharmaceutical knowledge and recent information
<b>b3</b>	Combine required specialties to manage the subject under study
<b>b4</b>	Integrate scientific results and write report following conducting research
<b>b5</b>	Manage risks and hazards related to professional practical area
<b>b6</b>	Design a laboratory protocol for the work
<b>b7</b>	Decide what to do with full responsibility in scientific research
<b>Professional and practical skills</b>	

<b>c1</b>	Perform practical work relative to experimental design. Apply different techniques related to practical thesis work.
<b>c2</b>	Use and evaluate practical data to write report
<b>c3</b>	Apply various biochemical techniques involved in the protocol
<b>General and Transferable skills</b>	
<b>d1</b>	Communicate effectively with all people related to the work
<b>d2</b>	Use information technology in review and thesis preparation
<b>d3</b>	Evaluate the work and learning needs
<b>d4</b>	Use various sources to get information about the subject understudy
<b>d5</b>	Set rules for evaluation and judging others performance.
<b>d6</b>	Work effectively as a member of a team
<b>d7</b>	Acquire time management skills
<b>d8</b>	Study independently and plan research studies.

#### **4. Thesis Content:**

<b>Steps</b>	<b>Content</b>
1 <sup>st</sup>	<p>Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point related to the problems of the community and surrounding environment.</p> <p>Collect all available information about this subject by all possible means.</p> <p>Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.</p> <p>Design the protocol including the steps of work following the</p>

	<p>suitable timetable.</p> <p>Increase the awareness of the recent biochemical and analytical techniques that will be used during practical work and determined by the protocol.</p> <p>Integrate different knowledge (biochemistry, pharmacological knowledge, biostatistics, histology ..... ) to solve suggested problem.</p> <p>Continuous evaluation to the thesis outcome according to the schedule.</p>
2 <sup>nd</sup>	<p>Identify different practical techniques and methods to assess biochemical parameters related to the subject under study.</p> <p>Operate scientific instruments according to instructions.</p> <p>Evaluate and manage hazards (chemical and biological) throughout the whole practical work.</p> <p>Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments).</p> <p>Perform surgical operations to prepare animal model to certain disease (nephrectomy, ovariectomy.....).</p> <p>Induction of some diseases in experimental animals (obesity, diabetes.....).</p> <p>Separate biological samples and tissues (e.g. blood, plasma, csf, urine, kidney, liver.....).</p> <p>Apply ethical recommendations during dealing with humans/ experimental animals.</p> <p>Understand any legal aspects related to the thesis work.</p>
3 <sup>rd</sup>	<p>Collect raw data for the tested biochemical parameters.</p> <p>Interpret raw data to get valuable information.</p> <p>Perform statistical analysis and biological correlation for the</p>

	<p>results.</p> <p>Present and describe the results graphically.</p> <p>Suggest solution to the problem understudy based on this presented data.</p>
4 <sup>th</sup>	<p>- Communicate with supervisors to discuss results and with patients to collect case history and samples.</p> <p>Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians).</p> <p>Present the results periodically in seminars.</p> <p>Write scientific reports on the obtained results with conclusive significance.</p> <p>Discuss obtained results in comparison with pervious literatures.</p> <p>Suggest possible recommendations based on the outcome of the thesis and decide future plans.</p> <p>Summarize the thesis in an understandable Arabic language for non professionals.</p> <p>Write references in the required form (Thesis, Paper.....).</p> <p>Demonstrate the thesis in a final power point presentation.</p> <p>Continue self-learning throughout the experimental work and writing scientific papers.</p>

### **5- Teaching and Learning Methods:**

- Self-learning (Activities, Research....)
- Open discussion

### **6- References:**

- **Books:** Robert A. Day and Barbara Gastel: How to Write and Publish a Scientific Paper, 7<sup>th</sup> edition, 2011. Library of congress cataloging-in-Publication Data. California, USA.
- **Websites:** Pubmed, Sciencedirect, Wileyinterscience

**Facilities required for:**

1. **For practical work:** U.V spectrophotometer, centrifuge, PCR, ELISA, Gamma counter, Electrophoresis

- 
- **Head of Department: Prof. Dr. Sahar El-Swefy**

تم إعتماده بمجلس القسم بتاريخ 2017

# PhD Degree



# Program Specification

---

## Program Specification

### A- Basic Information

- 1- Program title:** PhD. Pharm. Sci Degree in **Biochemistry**
- 2- Program type:** Single
- 3- Faculty/ University:** Faculty of Pharmacy, Zagazig University
- 4- Department:** Biochemistry
- 5- Coordinator:** Prof. Dr. Mohamed El-sewidy
- 6- Date of program specification approval:** 2017/2018

### B- Professional Information

#### 1- Program aims:

The PhD program, Zagazig University is a 3-5 five years pharmacy education offering a PHD degree in pharmaceutical sciences (Biochemistry). This Program aims at providing postgraduate students with knowledge, skills and abilities needed to practice the pharmacy profession effectively in various settings including Research Institutes, private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

#### **The program aims are summarized as follows:**

1. Provide the community with highly qualified and professionals with skills and ethical values based on National Academic Reference Standards (NARS).
2. have the advanced and in-depth knowledge and skills in areas related to b, clinical biochemistry , molecular biology , biotechnology and gene expression
3. Figure out the principles of disease pathophysiology and correlate between biochemical data and clinical outcome

4. Apply various recent and modern techniques in clinical biochemistry & molecular biology in diagnosis of metabolic disorders and gene therapy strategies
- 5-Plan study, develop innovate methods and tools in PCR, genomic & proteomic fields for the conduct of scientific research
- 6- Effectively use information technology for the preparation and submission of a detailed literature review
- 7-Actively participate in the awareness and development of the community.

### **Graduate Attributes:**

They should acquire the necessary attributes & skills in various Biochemistry aspects including the following:

1. To have recent theories and in-depth knowledge in the field of biochemistry as well as the closely related areas of pharmaceutical sciences.
2. Apply the relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.
3. Outline methods, techniques, tools and ethics of scientific research and academic practices.
4. Analyze, evaluate and utilize the data in logical inference processes as well as proposing solutions to specified problems in the light of the available data.
5. Conduct research studies that add to the current knowledge and publish scientific papers.
6. Assess hazards and risks in professional practice in his / her area of specialization.
7. Plan; take professional decisions and bears responsibility in wide

- array of pharmaceutical fields.
8. To be creative and can manage discussions and arguments based on evidence and logic.
  9. Apply the advanced professional skills in the area of specialization.
  10. Evaluate and improve methods and tools existing in the area of specialization.
  11. Write and evaluate professional reports
  12. Effective communication in different forms.
  13. Use the information technologies in to improve the professional practices.
  14. Help others to learn and evaluate their performances.
  15. Work in a team and lead teams carrying out various professional tasks.
  16. Direct scientific meetings and to manage time effectively.
  17. Develop Continuous and self learning.

## **2-Intended Learning Outcomes (ILOs):**

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for **Biochemistry** PhD of sciences degree.

### **2-1- Knowledge and Understanding :**

**On successful completion of the PHD degree Program, students will be able to:**

- A1. Explain in-depth information of Biochemistry and their relevant subjects including Molecular Biology, metabolic aspect and clinical Biochemistry.
- A2. Determine the role of biotransformation reactions and its impact on public health.

---

A3. Elucidate therapeutic aspects relying on controlling biotransformation activity.

A4. Utilize and correlate theoretical background to overcome difficulties of expected drug toxicity and environmental pollution.

A5. Spot the difference between gene expression in pro- and eukaryotes.

A6. Recognize the concept of cellular communication and signaling pathways that control gene expression.

A7. Delineate physiological contribution of hormones in normal and pathological conditions.

A8. Be familiar with hormone therapy.

A9. Develop and expand methods, techniques and ethics of scientific research.

A10. Identify ethical and legal aspects of academic and professional practice.

A11. Understand principles of quality assurance in Molecular Biology and endocrinology practice.

A12. Actively participate in the awareness and development of the community.

### 2-2 - Intellectual Skills:

**On successful completion of the PhD degree Program, students will be able to:**

B1- Analyze and evaluate information in the fields of biochemistry, molecular biology, and genetics.

B2- Utilize and correlate background and practical knowledge to overcome difficulties in the fields of biochemistry and molecular biology.

B3- Construct research study in biochemistry, molecular biology that open new horizons for the discovery of new biochemical pathways and mechanisms.

B4- Write professional scientific paper in biochemistry field.

B5- Determine practical difficulties in the field of clinical biochemistry and molecular biology.

B6- Develop current methods and techniques in clinical biochemistry and molecular biology.

B7- Take professional and scientific decisions regarding biochemical, molecular and genetic research.

B8- Demonstrate creativity and innovation in biochemical research study and practice.

B9- Manage seminars and open discussion settings in the field of biochemistry and relevant fields.

B10- Link between the specialized knowledge in the fields of biochemistry and molecular biology related disciplines for the advancement of scientific research to serve the profession of pharmacy

B11- Select suitable genomic & proteomic tools for diagnosis of different types of cancer & hereditary disorders.

B12- select appropriate tests for detecting patients at risk for specific diseases or in the early stage of disease, and to determine strategies for responding appropriately.

### **2-3 - Professional and Practical Skills:**

**It is intended that, on successful completion of the PhD degree Program, students will be able to:**

C1- Perform high quality laboratory techniques in biochemical analysis that fulfill good laboratory practice in clinical biochemistry research studies.

C2- Perform laboratory experiments safely with appropriate equipment, including molecular and conventional biochemical apparatus, computer software and hardware for data acquisition and analysis.

C3-Develop and innovate methods and tools and apply new methods of PCR, genomic & proteomic methods for the conduct of scientific research in the disciplines of biochemistry and molecular biology.

C4-Integrate basic fundamentals with new genetic profiling tools to enhance his performance.

C5-Integrate the above history, physical and laboratory test findings into a meaningful diagnostic formulation (Define problem and formulate differential diagnosis)

C6-Write and judge scientific research in biochemistry and related subjects.

C7- Use computer and internet skills professionally in biochemistry research.

#### **2-4 - General and Transferable Skills:**

**On successful completion of the PhD degree Program, students will be able to:**

D1- Communicate effectively with colleagues in the field of biochemistry and molecular biology and advise patients.

D2- Utilize information technology skills in professional development.

D3- Evaluate learning needs and professional performance of juniors.

D4- Practice self learning continuously to improve academic and professional performance.

D5- Retrieve information from different sources.

D6- Work effectively as a leader of team.

D7- Perform research study in the field of biochemistry within specified time.

D8- Establish life-long self-learning required for continuous professional development

D9-Use the skills required for the preparation and submission of a detailed literature review

D10- Write reports and essay on the different scientific items in the field of biochemistry

### **3- Academic Standards:**

- NARS (National Academic Reference Standards)

**Matrix:** Comparison between PhD degree program ILOs and the Academic Reference Standards (ARS, 2009)

	ARS		Program ILOs
Knowledge and Understanding	2.1.1	Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A1. Explain in-depth information of Biochemistry and their relevant subjects including Molecular Biology, metabolic aspect and clinical Biochemistry.
			A5. Spot the difference between gene expression in pro- and eukaryotes.
			A6. Recognize the concept of cellular communication and signaling pathways that control gene expression.
			A7. Delineate physiological contribution of hormones in normal and pathological conditions.
			A8. Be familiar with hormone therapy.
	2.1.2	Fundamentals, methods, techniques, tools and ethics of scientific research.	A9. Develop and expand methods, techniques and ethics of scientific research.
	2.1.3	The ethical and legal principles in pharmacy and academic practices.	A10. Identify ethical and legal aspects of academic and professional practice.



	2.1.4	The principles and bases of quality assurance in professional practice in the field of specialization.	A11. Understand principles of quality assurance in Molecular Biology and endocrinology practice.
	2.1.5	All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A2. Determine the role of biotransformation reactions and its impact on public health.
			A3. Elucidate therapeutic aspects relying on controlling biotransformation activity.
			A4. Utilize and correlate theoretical background to overcome difficulties of expected drug toxicity and environmental pollution
Intellectual skills	2.2.1	Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	A12. Actively participate in the awareness and development of the community.
			B1- Analyze and evaluate information in the fields of biochemistry, molecular biology, and genetics.
	2.2.2	Propose solutions to specified problems in the light of the available data (information).	B12- select appropriate tests for detecting patients at risk for specific diseases or in the early stage of disease, and to determine strategies for responding appropriately.
			B2- Utilize and correlate background and practical knowledge to overcome difficulties in the fields of biochemistry and molecular biology.
	2.2.3	Conduct research studies that add to the current knowledge.	B3- Construct research study in biochemistry, molecular biology that open new horizons for the discovery of new biochemical pathways and mechanisms
			B10- Link between the specialized knowledge in the fields of biochemistry and molecular biology related disciplines for the advancement of scientific research to serve the profession of pharmacy
	2.2.4	Formulate scientific papers.	B4- Write professional scientific paper in biochemistry field.

	2.2.5	Assess hazards and risks in professional practice in his / her area of specialization.	B5- Determine practical difficulties in the field of clinical biochemistry and molecular biology
	2.2.6	Plan to improve performance in the pharmaceutical area of interest.	B6- Develop current methods and techniques in clinical biochemistry and molecular biology.
			B11- Select suitable genomic & proteomic tools for diagnosis of different types of cancer & hereditary disorders.
	2.2.7	Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B7- Take professional and scientific decisions regarding biochemical, molecular and genetic research.
	2.2.8	Be creative and innovative.	B8- Demonstrate creativity and innovation in biochemical research study and practice.
	2.2.9	Manage discussions and arguments based on evidence and logic.	B9 Manage seminars and open discussion settings in the field of biochemistry and relevant fields.
Professional and Practical Skills	2.3.1	Mastery of basic and modern professional skills in the area of specialization.	C1- Perform high quality laboratory techniques in biochemical analysis that fulfill good laboratory practice in clinical biochemistry research studies
	2.3.2	Write and critically evaluate professional reports	C6- Write and judge scientific research in biochemistry and related subjects
	2.3.3	Evaluate and develop methods and tools existing in the area of specialization.	C3- Develop and innovate methods and tools and apply new methods of PCR, genomic & proteomic methods for the conduct of scientific research in the disciplines of biochemistry and molecular biology.
	2.3.4	Properly use technological means in a better professional practice.	C7- Use computer and internet skills professionally in biochemistry research
	2.3.5	Plan to improve professional practices and to improve the performance of other	C4- Integrate basic fundamentals with new genetic profiling tools to enhance his performance.

		scholars .	C5-Integrate history, physical and laboratory test findings into a meaningful diagnostic formulation (Define problem and formulate differential diagnosis)
General and Transferable Skills	2.4.1	Effective communication in its different forms.	D1- Communicate effectively with colleagues in the field of biochemistry and molecular biology and advise patients.
	2.4.2	Efficiently use the information technologies (IT) in improving the professional practices.	D2- Utilize information technology skills in professional development.
			D9-Use the skills required for the preparation and submission of a detailed literature review
			D10- Write reports and essay on the different scientific items in the field of biochemistry
	2.4.3	Help others to learn and evaluate their performances.	D3 Evaluate learning needs and professional performance of juniors.
	2.4.4	Self- assessment and continuous learning.	D4 Practice self learning continuously to improve academic and professional performance
			D8- Establish life-long self-learning required for continuous professional development
	2.4.5	Use various sources to get information and knowledge.	D5- Retrieve information from different sources .
	2.4.6	Work as a member and lead a team of workers .	D6 work effectively as a leader of team
	2.4.7	Direct scientific meetings and to manage time effectively.	D7- Perform research study in the field of biochemistry within specified time.

#### **4-Curriculum Structure and Contents:**

**a- Program duration:** 3- 5 years

**b- Program structure:**

- The PhD program can be completed in 3-5 years.

- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

**1- Courses:****No. of credit hours for program courses:**

Special: (3x4) 12

**2- Thesis:** 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the student must present (written and orally) a research proposal and write a thesis.

**3- General University Requirements:** 10 credit hours including:

- a- TOEFL (500 units)
- b- Computer course

**c-Program Curriculum:**

Course Code	Course Title	Credit hours	Program ILOs Covered
	Special Courses:		
Bsp4	Molecular endocrinology	4	A1, A7, A8, B1, B2, B8, D2 and D3
Bsp5	Biotransformation	4	A1, A2,A3, A4, B2, B10, D2, D3, D5 and D6
Bsp6	Regulation of gene Expression	4	A1, A5, A6, B1, B2, D1, D2, D4, D5 and D6

	Thesis	30	A1 to A12 B1 to B12 C1 to C7 D1 to D10
--	--------	----	---

### **5-Program admission requirements:**

**Applicants are admitted to PhD degree any time throughout the academic year upon fulfillment of the following:**

1. The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy and also finish M.Sc. degree of Biochemistry affiliated to the Egyptian Universities affiliated to the Egyptian Supreme Council of Universities (ESCU).
2. Students should fulfill all the admission requirements stated by the concerned Departmental Board.

### **Regulations to complete the programme:**

#### **Conditions of granting the degree**

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research Committee recommendation awards the PhD degree upon fulfillment of the following requirements:

1. Carrying out a deep research in the area of specialization for at least two calendar years from the time of registration.
2. The student has to succeed in all courses examinations.
3. Acceptance of the research thesis by the judges Committee according to statement 104 of universities regulating law.

### **Cancellation of Registration**

The Faculty Board is allowed to cancel registration for PhD programs in the following circumstances:

1. Student's failure to pass the course examinations for two times.
  2. Student's nonattendance or unsatisfactory progress in research work being reported by the advisors to the Departmental Board and forwarded to Graduate Studies and Research Committee for approval of cancellation.
  3. Dissertation refusal by the Jury Committee.
- Incapability of the student to graduate by the deadlines indicated

### **6- Admission Policy:**

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

### **7-Student assessment methods:**

Method	ILOS
Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills
Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

### **8-Failure in Courses:**

Students who fail to get 60% (1 point)

### **9-Methods of program evaluation**

Evaluator	Method	Sample
<b>Internal evaluator:</b> Professor Dr. Hoda El-sayed	Program evaluation Courses evaluation	Program report Courses report
<b>External evaluator:</b> Professor Dr. Mamdouh El-sheshtawy	Program evaluation Courses evaluation	Program report Courses report
<b>Others methods</b>	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

**Program coordinator**

**Prof. Dr. Mohamed El-Sweidy**

**Head of Department**

**Prof. Dr. Sahar El-Sweify**

PhD of Biochemistry (2017/2018)																												
Program Courses		Program intended learning outcomes																										
		Knowledge and understanding												Intellectual skills												P		
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	C1		
Special courses	Molecular endocrinology	√						√	√					√	√						√							
	Biotransformation	√	√	√	√										√								√					
	Regulation of gene expression	√				√	√							√	√													
Thesis		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	



# **Biotransformation**

## Course specification of Biotransformation

### Course specifications:

- Program on which the course is given: PhD of Pharmaceutical Sciences (biochemistry)
- Major or Minor element of program: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept.
- Date of specification approval: 2017/2018

### 1- Basic information:

Title: Biotransformation

Code: BSp5

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4 hrs/week

### 2-Overall aim of the course

On completion of the course, the students will be able to:

- Explain principles of biotransformation reactions and factors affecting these reactions.
- Define effects of xenobiotic processing on health.
- Analyze biotransformation information to conclude body processing of different xenobiotics as well as bioactivation causes.

### 3.Intended learning outcome s (ILOs) of Biotransformation

<b>A-Knowledge and Understanding</b>	
<b>a1</b>	Outline basics of biotransformation.
<b>a2</b>	Illustrate biotransformation reactions and processes in details.
<b>a3</b>	Compare between phase I and phase II biotransformation reactions.
<b>a4</b>	Explain biotransformation enzymes consequences of their induction & inhibition and their applications in pharmaceutical preparations.
<b>a5</b>	Summarize modifiers to xenobiotics biotransformation, bioactivation and their impact on public health.
<b>B-Intellectual skills</b>	
<b>b1</b>	Assess biotransformation reactions and factors influencing them to conclude different profiles xenobiotics.
<b>b2</b>	Propose causes of xenobiotics bioactivation and toxicity in the light of biotransformation background.
<b>D- General and transferable skills</b>	
<b>d1-</b>	Use information technology skills in developing professional practices
<b>d2-</b>	Gain different information from various sources
<b>d3-</b>	Work effectively as team leader with team workers

**4- Course Content of Biotransformation (PhD degree)**

Week number	Lecture contents (4hrs/week)
1	<ul style="list-style-type: none"><li>• Biotransformation (definition, biomedical importance)</li></ul>
2	<ul style="list-style-type: none"><li>• Biotransformation Reactions</li></ul>
3	<ul style="list-style-type: none"><li>• Phase I reactions</li></ul>
4	<ul style="list-style-type: none"><li>• Phase II reactions</li></ul>
5	<ul style="list-style-type: none"><li>• Phase III reactions, open discussion</li></ul>
6	<ul style="list-style-type: none"><li>• Biotransformation Sites</li></ul>
7	<ul style="list-style-type: none"><li>• Biotransformation Enzymes</li><li>• Activity (review article)</li></ul>
8	<ul style="list-style-type: none"><li>• Induction of Biotransformation Enzymes</li></ul>
9	<ul style="list-style-type: none"><li>• Inhibition of Biotransformation Enzymes</li></ul>
10	<ul style="list-style-type: none"><li>• Applications of enzymes induction</li><li>-Inhibition in pharmaceutical preparations</li></ul>
11	<ul style="list-style-type: none"><li>• Factors Affecting Biotransformation</li></ul>
12	<ul style="list-style-type: none"><li>• Bioactivation of xenobiotics</li></ul>
13	<ul style="list-style-type: none"><li>• Toxic effects of xenobiotics (i.e: carcinogenic, immunologic reactions, cell death...etc)</li></ul>
14	<ul style="list-style-type: none"><li>• Activity (presentation of review articles in journal club)</li></ul>
15	<ul style="list-style-type: none"><li>• Revision and open discussion</li></ul>

**5- Teaching and Learning Methods:**

- Lectures
- Self learning
- Group discussion and presentations

**6- Student Assessment methods:**

Written exams assess: a1, a2, a3, a4, a5, b1, b2

Oral exam assess: a1, a2, a3, a4, a5, b1, b2, d2

Activity assess: d1, d2, d3

**Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 7-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7- References and books:****A- Scientific paper(s):**

- Croom E. Metabolism of xenobiotics of human environments.  
Prog Mol Biol Transl Sci. 2012;112:31-88

**B- Essential book(s):**

- Mino R. Cairra, Corina Ionescu: Drug Metabolism: Current Concepts, 2005, Springer link, Netherland.

- Ala F. Nassar: Biotransformation and Metabolite Elucidation of Xenobiotics: Characterization and Identification, 2010. John wiley & sons, New Jersey, USA.

**C- Suggested book(s):**

- Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell and P. Anthony Weil : Harper's Illustrated Biochemistry (29<sup>th</sup> edition), 2012; The Mc Graw Hill companies Inc., USA.

**D- Websites:** pubmed, Sciencedirect, Nejm, Wileyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, overhead projectors, data show.

- 
- **Course Coordinators:** Prof Dr/ Mohamed Mahmoud ElSeweid
  - **Head of Department:** Prof Dr/ Sahar El-Swefy
  - **Date:** 2017 تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ

Matrix I of Biotransformation (2017-2018)											
Course Contents		ILOs of Biotransformation									
		Knowledge and Understanding					Intellectual skills		General and transferable skills		
		a1	a2	a3	a4	a5	b1	b2	d1	d2	d3
1	Biotransformation (definition, biomedical importance)	x									
2	Biotransformation reactions	x	X				x				
3	Phase I reactions	x	X	x			x				
4	Phase II reactions	x	X	x			x				
5	Phase III reactions and open discussion		X				x				
6	Biotransformation Sites		X				x				
7	Biotransformation Enzymes - activity (review article)		X						X	x	X
8	Induction of Biotransformation Enzymes				x						
9	Inhibition of Biotransformation Enzyme				x		x				
10	Applications of enzyme induction-inhibition in pharmaceutical preparations				x		x				
11	Factors Affecting Biotransformation					x	x				
12	Bioactivation of xenobiotics					x		x			
13	Toxic effects of xenobiotics i.e: carcinogenic, immunologic reactions, cell death..etc)					x		x			
14	Activity (presentations of review articles in journal club)	x	X	x	x	x	x	x	X	x	X
15	Revision and open discussion	x	X	x	x	x	x	x	X	x	X

### Matrix II of Biotransformation (2017-2018)

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A1. Explain in-depth information of Biochemistry and their relevant subjects including Molecular Biology, metabolic aspect and clinical Biochemistry.	a1- a2- a3	Biotransformation (definition, biomedical importance), Biotransformation reactions: phase I, phase II, phase III reactions- Biotransformation Sites-	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A2. Determine the role of biotransformation reactions and its impact on public health.	a1	Biotransformation (definition, biomedical importance), Biotransformation reactions: phase I, phase II, phase III reactions	Textbooks, Scientific papers and self learning	x	x	x	x	
		A3. Elucidate therapeutic aspects relying on controlling biotransformation activity.	a4	Biotransformation Enzymes, Enzymes induction & inhibition, Applications of enzymes induction -Inhibition in pharmaceutical preparations	Textbooks, Scientific papers and self learning	x	x	x	x	



		A4. Utilize and correlate theoretical background to overcome difficulties of expected drug toxicity and environmental pollution	a5	Factors Affecting Biotransformation, Bioactivation of xenobiotics, toxic effects of xenobiotics	Textbooks, Scientific papers and self learning	x	x	x	x	
Intellectual skills	2.2.2.Propose solutions to specified problems in the light of the available data (information).	B2- Utilize and correlate background and practical knowledge to overcome difficulties in the fields of biochemistry and molecular biology.	b2	Bioactivation of xenobiotics, toxic effects of xenobiotics	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3. Conduct research studies that add to the current knowledge.	B10- Link between the specialized knowledge in the fields of biochemistry and molecular biology related disciplines for the advancement of scientific research to serve the profession of pharmacy	b1	Biotransformation reactions: phase I, phase II, phase III reactions, Biotransformation Sites, Enzymes, Enzymes induction&inhibition, Factors Affecting Biotransformation,	Textbooks, Scientific papers and self learning	x	x	x	x	
General and transferable skills	2.4.2. Efficiently use the information technologies ( IT ) in improving the professional practices.	D2- Utilize information technology skills in professional development.	d1	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	x	x			x
	2.4.3.Help others to learn and evaluate their performances.	D3 Evaluate learning needs and professional performance of juniors.	d2	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	x	x			x

	2.4.5. Use various sources to get information and knowledge.	D5- Retrieve information from different sources .	d3	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	x	x			x
	2.4.6. Work as a member and lead a team of workers .	D6 work effectively as a leader of team	d3	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	x	x			x

# **Regulation of Gene Expression**

---

## Course specification of Regulation of gene expression

### Course specifications:

- Program (s) on which the course is given: PhD of Pharmaceutical Sciences
- Major or Minor element of programs: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept.
- Date of specification approval: 2017/2018

### 1- Basic information:

Title: Regulation of gene expression

Code: BSp6

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4 hrs/week

### 2-Overall aim of the course:

On completion of the course, the students will be able to:

- Outline principles of regulation of gene expression and its mechanism.
- Understand the signaling pathways related to gene expression.
- Apply the gene expression and cell signaling data in his/her profession.
- Develop skills necessary for proper professional practice.

### 3-Intended learning outcome s (ILOs) of Regulation of gene expression:

<b>A-Knowledge and Understanding</b>	
<b>a1</b>	Outline the process of gene expression.
<b>a2</b>	Differentiate between regulation of gene expression in prokaryotes and eukaryotes.
<b>a3</b>	Define the relation between drugs/diseases and gene expression.
<b>a4</b>	Understand the process of cell communication.
<b>a5</b>	Illustrate different signaling pathways.
<b>B-Intellectual skills</b>	
<b>b1</b>	Analyze and interpret alteration in gene expression.
<b>b2</b>	Utilize genetic information to clarify diseases arising from genetic abnormalities and suggest suitable detection method.
<b>b3</b>	Recognize the importance of microRNA in different diseases.
<b>b4</b>	Employ the acquired information to cope with advances in gene therapy.
<b>D- General and transferable skills</b>	
<b>d1</b>	Use information technology skills in developing professional practices.
<b>d2</b>	Gain different information from various sources.
<b>d3</b>	Apply skills required for the preparation of literature review.
<b>d4</b>	Work in a team.

**4- Course Content of Regulation of Gene expression**

Week number	Lecture contents (4hrs/week)
1	<ul style="list-style-type: none"> <li>Recall of Molecular Biology/Genetics- DNA, RNA and Protein synthesis</li> </ul>
2	<ul style="list-style-type: none"> <li>Evaluation test for the revisited materials (Test 1)</li> <li>Overview of gene expression</li> <li>Measuring gene expression (mRNA quantification, protein quantification and localisation)</li> <li>Regulatory sequences and Molecules</li> </ul>
3	<ul style="list-style-type: none"> <li>Regulation of prokaryotic gene expression               <ul style="list-style-type: none"> <li>Transcription of mRNA from bacterial operons</li> <li>Role of operators in prokaryotic transcription</li> <li>The lactose operon</li> <li>The tryptophan operon</li> <li>Coordination of transcription and translation in prokaryotes</li> </ul> </li> </ul>
4	<ul style="list-style-type: none"> <li>Regulation of eukaryotic gene expression               <ul style="list-style-type: none"> <li>Trans-acting molecules</li> <li>Cis-acting regulatory elements</li> <li>Regulation by co- and posttranscriptional processing of mRNA</li> <li>Regulation through modifications to DNA</li> </ul> </li> </ul>
5	<ul style="list-style-type: none"> <li>Quick test 2</li> <li>Preparation for Journal Club (activity)</li> </ul>
6	<ul style="list-style-type: none"> <li>Activity (review article) /discussion</li> </ul>
7	<ul style="list-style-type: none"> <li>MicroRNA (mi RNA)               <ul style="list-style-type: none"> <li>Overview, generation and function</li> <li>Experimental detection and manipulation of miRNA</li> <li>miRNA and disease (inherited diseases, cancer, heart disease, nervous system and obesity)</li> <li>miRNA and non-coding RNAs</li> </ul> </li> </ul>
8	<ul style="list-style-type: none"> <li>Drugs and gene expression (Acute versus chronic)</li> </ul>
9	<ul style="list-style-type: none"> <li>Disease and gene expression (Acute versus chronic)</li> </ul>
10	<ul style="list-style-type: none"> <li>Signaling pathways – basic principles</li> </ul>

	<ul style="list-style-type: none"> <li>Principles underlying cell communication with a focus on G protein pathways</li> </ul>
11	<ul style="list-style-type: none"> <li>Structure-function relationships and regulation of protein functions through phosphorylation</li> <li>Structure/function relationships and regulation of protein function by phosphatases</li> </ul>
12	<ul style="list-style-type: none"> <li>G Protein Signaling</li> <li>Signal Transduction Through Ion Channels</li> <li>Signals with Long-Term Consequences</li> <li>Systems Biology of Signaling</li> </ul>
13	<ul style="list-style-type: none"> <li>Signaling pathways that control gene expression</li> <li>Test 3</li> </ul>
14	<ul style="list-style-type: none"> <li>Activity (presentations) /discussion</li> </ul>
15	<ul style="list-style-type: none"> <li>Revision and open discussion</li> </ul>

### **5-Teaching and Learning Methods:**

- Lectures
- Self learning
- Group discussion and presentations

### **6-Student Assessment methods:**

Written exams assess: a1, a2, a3, a4, a5, b1, b2, b3 and b4

Oral exam assess: a1, a2, a3, a4, a5, b1, b2, b3 and b4

Activity assess: b2, b4, d1, d2, d3 and d4

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 5-6-14
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

**Weighting of Assessment:**

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

**7- References and books:****A- Scientific papers:**

- Gargalionis AN, Basdra EK. Insights in microRNAs Biology. Curr Top Med Chem. 2013.
- Li J, Zhang W, Zhou M, Kooger R, Zhang Y. Small Molecules Modulating Biogenesis or Processing of microRNAs with Therapeutic Potentials. Curr Med Chem. 2013

**B- Essential books:**

- Richard A. Harvey and Denise R. Ferrier: Lippincott's illustrated reviews: Biochemistry 5<sup>th</sup> edition 2011. Lippincott Williams & Wilkins, a Wolters Kluwer businessm, Philadelphia.
- Gupta P.K: Molecular Biology and genetic engineering: a textbook for University students, 1<sup>st</sup> edition, 2008. Rakesh Kumar Rastogi for Rastogi Publications, Newdelhi, India.

**C- Suggested books:**

- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. Biochemistry, 7<sup>th</sup> edition, 2012. WH Freeman and company, Newyork, USA.

**D- Websites:** pubmed, Science direct, Nejm, Weilyinterscience**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, computer, data show.

- 
- **Course Coordinators:** Prof Dr/ Mohamed Mahmoud ElSeweid
  - **Head of Department:** Prof Dr/ Sahar El-Swefy
  - **Date:** 2017 تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ



Matrix I of Regulation of Gene expression (2017-2018)														
Course Contents		ILOs												
		KU					IS				GTS			
		a1	a2	a3	a4	a5	b1	b2	b3	b4	d1	d2	d3	d4
1	Recall of Molecular Biology/Genetics- DNA, RNA and Protein synthesis	X												
2	Evaluation test for the revisited materials (Test 1) Overview of gene expression Measuring gene expression (mRNA quantification, protein quantification and localisation) Regulatory sequences and Molecules	X					x	X						
3	Regulation of prokaryotic gene expression Transcription of mRNA from bacterial operons Role of operators in prokaryotic transcription The lactose operon The tryptophan operon Coordination of transcription and translation in prokaryotes		X											
4	Regulation of eukaryotic gene expression Trans-acting molecules Cis-acting regulatory elements Regulation by co- and posttranscriptional processing of mRNA Regulation through modifications to DNA		X											
5	Quick test 2 Preparation for Journal Club (activity)										x	x		X
6	Activity (review article) /discussion							x		x	x	x	x	X
7	MicroRNA (mi RNA) Overview, generation and function Experimental detection and manipulation of miRNA miRNA and disease (inherited diseases, cancer, heart disease, nervous system and obesity) miRNA and non-coding RNAs								X					
8	Drugs and gene expression (Acute versus chronic)			x						X				
9	Disease and gene expression (Acute versus chronic)			X						x				
10	Signaling pathways – basic principles Principles underlying cell communication with a focus on G protein pathways				x	X								

11	Structure-function relationships and regulation of protein functions through phosphorylation Structure/function relationships and regulation of protein function by phosphatases					x				X				
12	G Protein Signaling Signal Transduction Through Ion Channels Signals with Long-Term Consequences Systems Biology of Signaling					X				x				
13	Signaling pathways that control gene expression Test 3					x				X				
14	Activity (presentations) /discussion							x		x	x	x		X
15	Revision and open discussion	X	x	x	x	x	x	x	x	x	x	x	x	x

### Matrix II of Regulation of gene expression (2017-2018)

Matrix II of Regulation of gene expression (2017-2018)										
ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A1. Explain in-depth information of Biochemistry and their relevant subjects including Molecular Biology, metabolic aspect and clinical Biochemistry.	a1	Recall of Molecular Biology/Genetics- DNA, RNA and Protein synthesis- Evaluation test for the revisited materials (Test 1) Overview of gene expression Measuring gene expression (mRNA quantification, protein quantification and localisation) Regulatory sequences and Molecules	Textbooks, Scientific papers and self learning	X	x	x	x	

				<p>Recall of Molecular Biology/Genetics- DNA, RNA and Protein synthesis- Evaluation test for the revisited materials (Test 1)</p> <p>Overview of gene expression</p> <p>Measuring gene expression (mRNA quantification, protein quantification and localisation)</p> <p>Regulatory sequences and Molecules- Regulation of prokaryotic gene expression</p> <p>Transcription of mRNA from bacterial operons</p> <p>Role of operators in prokaryotic transcription</p> <p>The lactose operon</p> <p>The tryptophan operon</p> <p>Coordination of transcription and translation in prokaryotes</p> <p>Regulation of eukaryotic gene expression</p> <p>Trans-acting molecules</p> <p>Cis-acting regulatory elements</p> <p>Regulation by co- and posttranscriptional processing of mRNA</p> <p>Regulation through modifications to DNA- Drugs and gene expression (Acute versus chronic)-</p> <p>Disease and gene expression (Acute versus chronic)</p>						
		A5. Spot the difference between gene expression in pro- and eukaryotes.	a1-a2-a3							

		A6. Recognize the concept of cellular communication and signaling pathways that control gene expression.	a4-a5	<p>Signaling pathways – basic principles</p> <p>Principles underlying cell communication with a focus on G protein pathways- Structure-function relationships and regulation of protein functions through phosphorylation</p> <p>Structure/function relationships and regulation of protein function by phosphatases- G Protein Signaling</p> <p>Signal Transduction Through Ion Channels</p> <p>Signals with Long-Term Consequences</p> <p>Systems Biology of Signaling- Signaling pathways that control gene expression</p>						
Intellectual skills	2.2.1. Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B1- Analyze and evaluate information in the fields of biochemistry, molecular biology, and genetics.	b1-b2-b3-b4	<p>Evaluation test for the revisited materials (Test 1)</p> <p>Overview of gene expression</p> <p>Measuring gene expression (mRNA quantification, protein quantification and localisation)</p> <p>Regulatory sequences and Molecules- MicroRNA (mi RNA)</p> <p>Overview, generation and function</p>						

			<p>Experimental detection and manipulation of miRNA</p> <p>miRNA and disease (inherited diseases, cancer, heart disease, nervous system and obesity)</p> <p>miRNA and non-coding RNAs-</p> <p>Drugs and gene expression</p> <p>(Acute versus chronic)- Disease and gene expression (Acute versus chronic)-Structure-function relationships and regulation of protein functions through phosphorylation</p> <p>Structure/function relationships and regulation of protein function by phosphatases- G</p> <p>Protein Signaling</p> <p>Signal Transduction Through Ion Channels</p> <p>Signals with Long-Term Consequences</p> <p>Systems Biology of Signaling-</p> <p>Signaling pathways that control gene expression- Activity</p>						
--	--	--	--	--	--	--	--	--	--

	2.2.2.Propose solutions to specified problems in the light of the available data (information).	B2- Utilize and correlate background and practical knowledge to overcome difficulties in the fields of biochemistry and molecular biology.	b3-b4	MicroRNA (mi RNA) Overview, generation and function Experimental detection and manipulation of miRNA miRNA and disease (inherited diseases, cancer, heart disease, nervous system and obesity) miRNA and non-coding RNAs- Drugs and gene expression (Acute versus chronic)- Disease and gene expression (Acute versus chronic)-Structure-function relationships and regulation of protein functions through phosphorylation Structure/function relationships and regulation of protein function by phosphatases- G Protein Signaling Signal Transduction Through Ion Channels Signals with Long-Term Consequences Systems Biology of Signaling- Signaling pathways that control gene expression- Activity	Textbooks, Scientific papers and self learning	X	x	x	x	
and transferabl	2.4.1.Effective communication in its different forms.	D1- Communicate effectively with colleagues in the field of biochemistry and molecular biology and advise patients.	d3-d4	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	X	x			x

2.4.2. Efficiently use the information technologies ( IT ) in improving the professional practices.	D2- Utilize information technology skills in professional development.	d1	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	X	x			x
2.4.4. Self- assessment and continuous learning.	D4 Practice self learning continuously to improve academic and professional performance	d2	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	X	x			x
2.4.5. Use various sources to get information and knowledge.	D5- Retrieve information from different sources .	d2	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	X	x			x
2.4.6. Work as a member and lead a team of workers .	D6 work effectively as a leader of team	d4	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	X	x		x	x



# Molecular Endocrinology

---

## Course specification of Molecular Endocrinology

### **Course specifications:**

- Program on which the course is given: PhD of Pharmaceutical Sciences (Biochemistry)
- Major or Minor element of program: Major
- Department offering the program: Biochemistry Dept.
- Department offering the course: Biochemistry Dept.
- Date of specification approval: 2017/2018

### **1- Basic information:**

Title: Molecular endocrinology

Code: BSp4

Lectures: 4 hrs/week

Credit hours: 4 hrs/week

Total: 4 hrs/week

### **2- Overall aim of the course**

On completion of the course, the students will be able to understand concepts of hormone receptor action, signal transduction, basic and gene regulation by hormones, molecular evolution of the endocrine system, as well as critically read and discuss the current literature in the field.

### 3. Intended learning outcome s (ILOs) of Molecular endocrinology

<b>A- Knowledge and Understanding</b>	
<b>a1</b>	Recall the basic knowledge of general endocrinology.
<b>a2</b>	Outline different hormone receptors include nuclear, membrane, cytokine, and enzyme linked receptors and their regulation
<b>a3</b>	Explain various transduction mechanisms and hormonal gene regulation
<b>a4</b>	Evaluate hormone therapy and targeted molecular therapy
<b>B- Intellectual skills</b>	
<b>b1</b>	Analyze the role of receptors in mediating hormonal action and in regulation of hormone secretion.
<b>b2</b>	Determine symptoms of hormonal abnormalities in the light of academic study.
<b>b3</b>	Demonstrate creativity in selection of the most appropriate hormonal therapy used for treatment various endocrinal disorders by comparing between its benefits and risks.
<b>D- General and transferable skills</b>	
<b>d1</b>	Use information technology skills in developing professional practices
<b>d2</b>	Gain different information from various sources

#### **4. Course Content of Molecular endocrinology**

<b>Week number</b>	<b>Lecture contents (4hrs/week)</b>
<b>1</b>	<ul style="list-style-type: none"><li>• Review of general endocrinology</li></ul>
<b>2</b>	<ul style="list-style-type: none"><li>• Introduce the field of molecular endocrinology and biomedical importance</li></ul>
<b>3</b>	<ul style="list-style-type: none"><li>• Hormones (Definition, general functions, classification)</li></ul>
<b>4</b>	<ul style="list-style-type: none"><li>• Transport of hormones</li><li>• Storage of hormones</li></ul>
<b>5</b>	<ul style="list-style-type: none"><li>• Hormone receptors and regulation</li></ul>
<b>6</b>	Nuclear Receptors Hormone Receptors as Transcription Factors Post-transcriptional Gene Regulation Mechanism of action of steroidal hormones (Student presentation)
<b>7</b>	Receptor Regulation Membrane Receptors Cytokine Receptors Enzyme-linked Receptors and their actions (Student presentation)
<b>8</b>	<ul style="list-style-type: none"><li>• Mechanism of action of hormones that use cAMP as second messenger</li></ul>
<b>9</b>	<ul style="list-style-type: none"><li>• Mechanism of action of hormones that use cGMP as second messenger</li></ul>
<b>10</b>	<ul style="list-style-type: none"><li>• G Protein-Coupled Receptors and their actions</li><li>• Calcium, Calmodulin and Phospholipids</li><li>• Mechanism of action of hormones that use calcium and phospholipids as second messenger</li><li>• Activity (review article)</li></ul>
<b>11</b>	<ul style="list-style-type: none"><li>• Molecular Aspect of hormonal regulation</li></ul>
<b>12</b>	<ul style="list-style-type: none"><li>• Diseases associated with hormone disorders</li></ul>
<b>13</b>	<ul style="list-style-type: none"><li>• Hormone therapy benefits and / or hazards</li></ul>
<b>14</b>	<ul style="list-style-type: none"><li>• Hormone therapy and targeted molecular therapy</li></ul>
<b>15</b>	<ul style="list-style-type: none"><li>• Revision</li><li>• Activity (presentations)</li></ul>

## **5- Teaching and Learning Methods:**

- Lectures
- Self learning
- Group discussion and presentations

## **6- Student Assessment methods:**

Written exams assess: a1, a2, a3, a4, b1, b2, b3  
Oral exam assess: a1, a2, a3, a4, b1, b2, b3, d2  
Activity assess: d1, d2

### **Assessment schedule:**

<b>Assessment (1):</b> Activity	Week 6-7-10-15
<b>Assessment (2):</b> Written exam	Week 16
<b>Assessment (3):</b> oral exam	Week 16

### **Weighting of Assessment:**

<b>Assessment method</b>	<b>Marks</b>	<b>Percentage</b>
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## **7- References and books:**

### **A- Scientific papers:**

- Papers and reviews from Endocrine reviews (Journal of the Endocrine Society)

### **B- Essential books:**

- Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell and P. Anthony Weil: Harper's

---

Illustrated Biochemistry (29<sup>th</sup> edition), 2012; The Mc Graw Hill companies Inc., USA.

- Molecular Endocrinology (3rd ed.) 2004 by Franklin F. Bolander. Elsevier Academic Press, London, UK.

**C- Suggested books:**

- Martin Andrew Crook: Clinical Biochemistry and Metabolic Medicine, 8<sup>th</sup> edition, 2012. Hodder and Stoughton ltd, London.

**D- Websites:** pubmed, Sciencedirect, Nejm, Wileyinterscience

**Facilities required for teaching and learning:**

1. **For lectures:** Black (white) boards, Computer, data show.

- 
- **Course Coordinators:** Prof Dr/ Sahar El-Swefy
  - **Head of Department:** Prof Dr/ Sahar El-Swefy
  - **Date:** 2017/ تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ

**Matrix I of Molecular endocrinology (2017-2018)**

Course Contents		ILOs of Molecular endocrinology								
		KU				IS			GTS	
		a1	a2	a3	a4	b1	b2	b3	d1	d2
1	Review of general endocrinology	X								
2	Introduce the field of molecular endocrinology and biomedical importance	X								
3	Hormones (Definition, general functions, classification)	X				x				
4	Transport of hormones Storage of hormones	X				x				
5	Hormone receptors and regulation		x			x				
6	Nuclear Receptors Hormone Receptors as Transcription Factors Post-transcriptional Gene Regulation Mechanism of action of steroidal hormones (Student presentation)		x			x			x	x
7	Receptor Regulation Membrane Receptors Cytokine Receptors Enzyme-linked Receptors and their actions (Student presentation)		x			x			x	x
8	Mechanism of action of hormones that use cAMP as second messenger			x		x				
9	Mechanism of action of hormones that use cGMP as second messenger			x						
10	G Protein-Coupled Receptors and their actions Calcium, Calmodulin and Phospholipids Mechanism of action of hormones that use			x						

	calcium and phospholipids as second messenger Activity (review article)									
11	Molecular Aspect of hormonal regulation			X		x			x	x
12	Diseases associated with hormone disorders				x		x	x		
13	Hormone therapy benefits and / or hazards				X			x	x	x
14	Hormone therapy and targeted molecular therapy				X		x	x	x	X
15	Revision, open discussion • Activity (presentations)	X	x	x	X	x	x	x	x	X



### Matrix II of Molecular Endocrinology (2017-2018)

Matrix II of Molecular Endocrinology (2017-2018)										
ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A1. Explain in-depth information of Biochemistry and their relevant subjects including Molecular Biology, metabolic aspect and clinical Biochemistry.	a1-a2-a3-a4	Review of general endocrinology	Textbooks, Scientific papers and self learning	x	x	x	x	
				Introduce the field of molecular endocrinology and biomedical importance						
				Hormones (Definition, general functions ,classification						
				Transport of hormones						
				Storage of hormones						
				Hormone receptors and regulation						
				Hormone Receptors as Transcription Factors Post-transcriptional Gene Regulation						
				Mechanism of action of steroidal hormones						
				Receptor Regulation						
				Membrane Receptors						
Cytokine Receptors										

			Enzyme-linked Receptors and their actions Mechanism of action of hormones that use cAMP as second messenger Mechanism of action of hormones that use cGMP as second messenger G Protein-Coupled Receptors and their actions Calcium, Calmodulin and Phospholipids Mechanism of action of hormones that use calcium and phospholipids as second messenger Molecular Aspect of hormonal regulation Diseases associated with hormone disorders Hormone therapy benefits and / or hazards Hormone therapy and targeted molecular therapy						
	A7. Delineate physiological contribution of hormones in normal and pathological conditions.	a1-a2-a3-a4	Hormones (Definition, general functions ,classification Transport of hormones Storage of hormones Hormone receptors and regulation	Textbooks, Scientific papers and self learning	x	x	x	x	x

				Hormone Receptors as Transcription Factors Post- transcriptional Gene Regulation Mechanism of action of steroidal hormones Receptor Regulation Membrane Receptors Cytokine Receptors Enzyme-linked Receptors and their actions Mechanism of action of hormones that use cAMP as second messenger Mechanism of action of hormones that use cGMP as second messenger G Protein-Coupled Receptors and their actions Calcium, Calmodulin and Phospholipids Mechanism of action of hormones that use calcium and phospholipids as second messenger Molecular Aspect of hormonal regulation Diseases associated with hormone disorders					
--	--	--	--	--	--	--	--	--	--

		A8. Be familiar with hormone therapy.	a4	Transport of hormones - Storage of hormones- Hormone therapy benefits and / or hazards Hormone therapy and targeted molecular therapy	Textbooks, Scientific papers and self learning	X	x	x	x	x
Intellectual skills	2.2.1. Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B1- Analyze and evaluate information in the fields of biochemistry, molecular biology, and genetics.	b1	Hormone receptors and regulation Hormone Receptors as Transcription Factors Post-transcriptional Gene Regulation Mechanism of action of steroidal hormones Receptor Regulation Membrane Receptors Cytokine Receptors Enzyme-linked Receptors and their actions Mechanism of action of hormones that use cAMP as second messenger Mechanism of action of hormones that use cGMP as second messenger G Protein-Coupled Receptors and their actions Calcium, Calmodulin and Phospholipids Mechanism of action of hormones that use calcium	Textbooks, Scientific papers and self learning	X	x	x	x	x

				and phospholipids as second messenger Molecular Aspect of hormonal regulation						
	2.2.2. Propose solutions to specified problems in the light of the available data (information).	B2- Utilize and correlate background and practical knowledge to overcome difficulties in the fields of biochemistry and molecular biology.	b2	Diseases associated with hormone disorders	Textbooks, Scientific papers and self learning	X	x	x	x	
	2.2.8.Be creative and innovative.	B8- Demonstrate creativity and innovation in biochemical research study and practice.	b3	Hormone therapy benefits and / or hazards Hormone therapy and targeted molecular therapy	Textbooks, Scientific papers and self learning	X	x	x	x	
General and transferable skills	2.4.2. Efficiently use the information technologies ( IT ) in improving the professional practices.	D2- Utilize information technology skills in professional development.	d1	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	X	x			x
	2.4.3.Help others to learn and evaluate their performances.	D3 Evaluate learning needs and professional performance of juniors.	d2	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	X	x			x

# **Thesis Specification**

---

## Thesis Specification of PhD Degree

### A- Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical sciences (Biochemistry)
- **Major or Minor element of program:** Major
- **Department offering the program:** Biochemistry Dept.
- **Department offering the thesis:** Biochemistry Dept.
- **Date of specification approval:** 2017/2018

### 1- Basic information:

Title: PhD Thesis in Biochemistry

Credit hours: 30 hrs

### 2- Overall aim of the thesis:

After being accepted by the Faculty authority, the candidate has to recall the research plan of the University and the Faculty to select the research area which he/she is going to fit with

#### **On completion of the thesis, the students will be able to:**

- Outline the possible protocol for solving harsh problem that the candidate can work after integrating suitable knowledge about this point of research
- Perform highly advanced techniques and methods used in the experimental work according to the designed protocol
- Derive and present the results of the study from the data collected
- Analyze the results of the study in the light of prior knowledge
- Suggest the possible solutions for the problem(s) under investigation.
- Imply new modifications that can be used to develop some techniques/methods.
- Transfer theoretical/practical experience to junior researches.

### 3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
<b>a1</b>	Illustrate advanced bases of Biochemistry, Molecular Biology, genetics, and metabolic pathways related to main objectives of the thesis
<b>a2</b>	Identify recent techniques, methods to analyze biochemical samples as well as ethics of scientific research
<b>a3</b>	Understand the legal aspects of for professional and academic practices
<b>a4</b>	Define GLP and quality assurance bases related to practical work of the thesis
Intellectual skills	
<b>b1</b>	Solve problems related to practical work by obtained quantitative data from the practical work
<b>b2</b>	Discuss professional problems and suggest solutions relay on different pharmaceutical knowledge and recent information
<b>b3</b>	Plan a research in the field of Biochemistry and Molecular Biology that allow discovery of alternative effects and pathways to add to current data.
<b>b4</b>	Integrate scientific results and write report following conducting research
<b>b5</b>	Manage risks and hazards related to professional practical area
<b>b6</b>	Adopt GLP principles in research to develop laboratory performance
<b>b7</b>	Decide what to do with full responsibility in scientific research
<b>b8</b>	Demonstrate creativity and innovation in modifying techniques and in utilization of various therapies.



<b>b9</b>	Manage evidence based arguments in the field of biochemistry and metabolism.
Professional and practical skills	
<b>c1</b>	Perform practical work relative to experimental design. Apply recent techniques related to practical thesis work.
<b>c2</b>	Use and evaluate practical data to write report
<b>c3</b>	Estimate laboratory techniques used in biochemistry and genetics lab. Develop methods of assay of various parameters. Apply GLP in Biochemistry research to develop laboratory performance.
<b>c4</b>	Apply technology in methodology development during practical work. Use IT skills in collecting information, presenting results and writing thesis
<b>c5</b>	Modify laboratory techniques.
General and Transferable skills	
<b>d1</b>	Interact with health care professional.
<b>d2</b>	Use information technology in review and thesis preparation
<b>d3</b>	Set rules for evaluation and judge others performance.
<b>d4</b>	Study independently and evaluate learning needs in biochemistry and molecular biology.
<b>d5</b>	Reprocess up-to-date information in biochemistry and molecular biology.
<b>d6</b>	Implement tasks as a member of a team.
<b>d7</b>	Utilize time effectively to achieve goals
<b>d8</b>	Work effectively as leader of a team
<b>d9</b>	Able to present data orally and participate in workshops and conferences
<b>d10</b>	Transfer theoretical/practical experience to junior researches

**4. Thesis Content:**

Steps	Content
1 <sup>st</sup>	<ul style="list-style-type: none"><li>-Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point.</li><li>-Collect recent information about this subject by all possible means.</li><li>-Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.</li><li>-Design the protocol including the steps of work following the suitable timetable.</li><li>-Increase the awareness of the recent biochemical and analytical techniques that will be used during practical work and determined by the protocol.</li><li>-Integrate different knowledge (biochemistry, pharmacological knowledge, biostatistics, histology ..... ) to solve suggested problem.</li><li>-Continuous evaluation to the thesis outcome according to the schedule.</li></ul>

2 <sup>nd</sup>	<ul style="list-style-type: none"><li>-Identify different practical techniques and methods to assess biochemical parameters related to the subject under study.</li><li>-Operate scientific instruments according to instructions and GLP basics.</li><li>-Evaluate and manage hazards (chemical and biological) throughout the whole practical work.</li><li>-Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments).</li><li>-Perform surgical operations to prepare animal model to certain disease (nephrectomy, ovariectomy.....).</li><li>-Induction of some diseases in experimental animals (obesity, diabetes.....).</li><li>-Separate biological samples and tissues (e.g. blood, plasma, csf, urine, kidney, liver.....).</li><li>-Apply ethical recommendations during dealing with humans/ experimental animals</li></ul>
3 <sup>rd</sup>	<ul style="list-style-type: none"><li>-Collect raw data for the tested biochemical parameters.</li><li>-Modify methods for biological samples analysis</li><li>-Interpret raw data to get valuable information.</li><li>-Perform statistical analysis and biological correlation for the results.</li><li>-Present and describe the results graphically.</li><li>-Suggest solution to the problem under study based on this presented data.</li></ul>

4 <sup>th</sup>	<ul style="list-style-type: none"> <li>-Communicate with supervisors to discuss results and with patients to collect case history and samples.</li> <li>-Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians).</li> <li>-Present the results periodically in seminars.</li> <li>-Define ethics of scientific research.</li> <li>-Write scientific reports on the obtained results with conclusive significance.</li> <li>-Discuss obtained results in comparison with pervious literatures.</li> <li>-Suggest possible recommendations based on the outcome of the thesis and decide future plans.</li> <li>-Summarize the thesis in an understandable Arabic language for non professionals.</li> <li>-Write references in the required form (Thesis, Paper.....).</li> <li>-Demonstrate the thesis in a final power point presentation.</li> <li>-Continue self-learning throughout the experimental work and writing scientific papers.</li> </ul>
5 <sup>th</sup>	<ul style="list-style-type: none"> <li>- Prepare research paper(s) for publication in national/international journals.</li> <li>- Participate in national/international conferences to present the findings of his/her thesis.</li> </ul>

### 5- Teaching and Learning Methods:

- Self-learning (Activities, Research....)
- Open discussion and presentations

## 6- References:

- **Books:** Robert A. Day and Barbara Gastel: How to Write and Publish a Scientific Paper, 7<sup>th</sup> edition, 2011. Library of congress cataloging-in-Publication Data. California, USA.
- **Websites:** Pubmed, Sciencedirect, Wileyinterscience

### Facilities required for:

1. **For practical work:** U.V spectrophotometer, centrifuge, PCR, ELISA, Gamma counter, Electrophoresis
- 

**Head of Department: Prof. Dr. Sahar El-Swefy**