Zagazig University

Faculty of Pharmacy

Biochemistry Department

Program and Course Specifications

PhD Degree

Program Specification

Program Specification

A- Basic Information

1- Program title: Ph.D. Pharm. Sci Degree in **Biochemistry**

2- Program type: Monodisciplinary.

3- Faculty/ University: Faculty of Pharmacy, Zagazig University

4- Department: Biochemistry

5- Coordinator: Assis. Prof. Nahla Younis

6- Date of program specification approval: 2019

7- Language of study: English

8- Academic Reference Standards:

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 issued by (NAQAA) (National Authority for Quality Assurance and Accreditation).

b. The program ILOs were compared to the Ph.D. program awarded by University of Illinois, USA.

B- Professional Information

1- Program aims:

This Program aims at extending the knowledge and skills of postgraduate master students in the field of biochemistry to apply to the provision in various settings including research Institutes, private and public hospitals and universities.

The program aims are summarized as follows:

1. Produce graduates with advanced knowledge in biochemistry and related aspects.

2. Build up students capabilities to critically evaluate current research and practice.

3. Produce graduates with critical thinking, integrative capabilities and problem-solving skills.

4-Develop independent research abilities from developing research ideas, study design, data collection and analysis throughout scientific publication.

Consistency of the program aims with the mission of Faculty of Pharmacy:

The faculty of Pharmacy, Zagazig University aims to provide the local and regional community with highly qualified, multidisciplinary and professional pharmacists with ethical values and able to participate in the development of drug industry and quality assurance as well as contribute to a distinguished health service to the society.

1.1 Graduate attributes:

The PhD of Biochemistry aims to provide graduates with the opportunity to develop the following attributes, upon successful completion of the programme, the graduate will be able to:

1. Demonstrate comprehensive knowledge of biochemistry and related aspects.
2. Identify a therapeutic issue concerning an individual patient
3. Demonstrate high level of critical thinking, problem solving and decision making skills
4. Demonstrate self-motivation, attention to detail, time-management, communication and computer skills
5. Conduct a scientific research with preparation of a published article.
6. Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the discipline

2-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and develop skills appropriate for PhD of biochemistry.

2-1- Knowledge and Understanding :

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

A.1 Recall the basic theories and principles of genetics, regulation of gene expression, molecular endocrinology and biotransformation.

A.2 Identify different body defense responses against diseases, xenobiotics and carcinogens.

A.3 Outline updated research trends in the fields of biochemistry and molecular biology.

A.4 Recognize the effect of recent advances in biochemistry and related subjects on community.

A.5 Illustrate basic principles of quality assurance in experimental and clinical researches.

A.6 Describe recent techniques applicable to current research in biochemistry.

A.7 Outline the ethical guidelines in reporting data, citing literature and publishing a scientific reports in international journals.

2-2 - Intellectual Skills:

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

B1. Evaluate the available data provided in the field of biochemistry and molecular biology.

B2. Select the appropriate analytical and diagnostic tool to assess endocrine disorders.

B3. Integrate accumulated knowledge and skills in biochemistry and biotransformation to suggest solutions for research and professional problems.

B.4. Suggest plans for enhancing performance in the field of biochemistry based on recent available evidence based information.

B.5. Assess the laboratory hazards including the use of chemicals, research animals and experimental procedures.

B.6. Design an original research project.

B7. Write up original research and submit for scientific publication.

2-3 - Professional and Practical Skills:

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

C1- Perform a wide range of laboratory work in the fields of biochemistry and molecular biology.

C2- Interpret clinical data and write professional reports.

C3- Use research tools and equipment relevant to clinical research including ELISA, RT-PCR, WB, IHC and others with application of good laboratory practice

C4- Elaborate different strategies to enhance practical work

2-4 - General and Transferable Skills:

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

D1- Communicate effectively with colleagues, other professionals and patients.

D.2- Use computer and statistical skills required for the preparation and submission of a complete research article

D.3- Retrieve information from different information sources

D.4- Implement writing and presentation skills

D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues

D.6- Capable of self-evaluation and continuous learning for professional development

D.7- Demonstrate time management, problem solving and decision making skills

3- Academic Standards:

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 issued by (NAQAA) (National Authority for Quality Assurance and Accreditation).

b. The program ILOs were compared to Ph.D Biochemistry program offered by University of Illinois, USA.

Matrix1: Comparison of graduate attributes of pharmacy practice Ph-D program with the Academic Reference Standards {ARS, 2009} developed by NAQAAE

Attributes of the graduates (ARS, 2009)	Attributes of the graduates (Ph-D Degree in pharmacy practice)
1.Apply the specialized knowledge he has acquired in his professional practice	1. Demonstrate comprehensive knowledge of biochemistry and related aspects.

2. Identify and solve professional problems. 5. Take decisions using available information.	2. Identify a therapeutic issue concerning an individual patient. 3. Demonstrate a high level of critical thinking, problem solving and decision making skills.
9. Be a lifelong learner and able to develop himself. 3.Show good communication and leadership skills. 4. Use technology effectively in his professional practice.	4. Demonstrate self-motivation, attention to detail, time-management, communication and computer skills.
6. Use available resources efficiently.	5. Conduct a scientific research with preparation of a published article.
7. Aware of his role in community service and development.	6. Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the discipline.
8. Reflect commitment to integrity, credibility and accountability.	

Matrix 2: Comparison between PhD degree program ILOs and the Academic Reference Standards, 2009.

ARS vs. Program ILOs for PhD in biochemistry		
	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.	A.1 Recall the basic theories and principles of genetics, regulation of gene expression, molecular endocrinology and biotransformation. A.2 Identify different body defense responses against diseases, xenobiotics and carcinogens. A.3 Outline updated research trends in the fields of biochemistry and molecular biology.
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.6 Describe recent techniques applicable to current research in biochemistry.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.7 Outline the ethical guideline in reporting data, citing literature and publishing a scientific reports in international journals.
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.5 Illustrate basic principles of quality assurance in experimental and clinical researches.
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.4 Recognize the effect of recent advances in biochemistry and related subjects on community.

ARS vs. Program ILOs for PhD in biochemistry		
	ARS	**Program ILOs**
Intellectual Skills	2.2.1- Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B1. Evaluate the available data provided in the field of biochemistry and molecular biology.
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B2. Select the appropriate analytical and diagnostic tool to assess endocrine disorders.
	2.2.3- Conduct research studies that add to the current knowledge.	B.6. Design and carry out an original research project.
	2.2.4- Formulate scientific papers.	B.7. Write up original research in and submit for scientific publication.
	2.2.5- Assess hazards and risks in professional practice in his / her area of specialization.	B.5. Assess the laboratory hazards including the use of chemicals, research animals and experimental procedures.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.4. Suggest plans for enhancing performance in the field of biochemistry based on recent available evidence based information.
	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B3. Integrate accumulated knowledge and skills in biochemistry and biotransformation to suggest solutions for research and professional problems.
	2.2.8- Be creative and innovative.	

ARS vs. Program ILOs for PhD in biochemistry		
	ARS	**Program ILOs**
	2.2.9- Manage discussions and arguments based on evidence and logic.	
Professional and Practical Skills	2.3.1- Mastery of basic and modern professional skills in the area of specialization.	C1- Perform a wide range of laboratory work in the fields of biochemistry and molecular biology.
	.3.2- Write and critically evaluate professional reports.	C2- Interpret clinical data and write professional reports.
	2.3.3- Evaluate and develop methods and tools existing in the area of specialization.	C3- Use research tools and equipment relevant to clinical research including ELISA , RT-PCR , WB, IHC and others with application of good laboratory practice
	2.3.4- Properly use technological means in a better professional practice.	
	2.3.5- Plan to improve professional practices and to improve the performance of other scholars.	C4- Elaborate different strategies to enhance practical work
General and Transferable Skills	2.4.1- Effective communication in its different forms.	D1- Communicate effectively with colleagues, other professionals and patients.
	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use computer and statistical skills required for the preparation and submission of a complete research article

ARS vs. Program ILOs for PhD in biochemistry		
	ARS	**Program ILOs**
	2.4.3- Help others to learn and evaluate their performance.	D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues
	2.4.5- Use various sources to get information and knowledge.	D.3- Retrieve information from different information sources D.4- Implement writing and presentation skills
	2.4.4- Self- assessment and continuous learning.	D.6- Capable of self-evaluation and continuous learning for professional development
	2.4.6- Work as a member and lead a team of workers.	D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Demonstrate time management, problem solving and decision making skills

Matrix3: Comparison of the program ILOs with Ph.D Biochemistry program offered by University of Illinois, USA.

Ph.D programme in Biochemistry offered by University of Illinois, USA.	Ph.D. in Biochemistry
1. Develop and demonstrate an in-depth knowledge of a specific area of biochemical research, which may include (but is not limited to) protein, nucleic acid and/or membrane biochemistry, cancer and molecular immunology, computational and quantitative biology, etc.	A.1 Recall the basic theories and principles of genetics, regulation of gene expression, molecular endocrinology and biotransformation. A.2 Identify different body defense responses against diseases, xenobiotics and carcinogens. A.3 Outline updated research trends in the fields of biochemistry and molecular biology. A.4 Recognize the effect of recent advances in biochemistry and related subjects on community. A.6 Describe recent techniques applicable to current research in biochemistry.
2. Demonstrate independent and critical skills necessary to formulate specific experiments aimed at understanding molecular processes.	C1- Perform a wide range of laboratory work in the fields of biochemistry and molecular biology. C3- Use research tools and equipment relevant to clinical research including ELISA, RT-PCR, WB, IHC and others with application of good laboratory practice.
3. Gain the necessary experience and skills to train others in the performance of experiments.	D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues
4. Develop communication skills suitable to discuss scientific outcomes at	D1- Communicate effectively with colleagues, other professionals and patients.

a level for the layperson to understand but critical enough for peers. Typically, such training is developed through writing and editing scientific manuscripts, with input from a faculty advisor.	D.2- Use computer and statistical skills required for the preparation and submission of a complete research article
5. Deliver effective oral and written presentations of the results and conclusions of experimental work.	C2- Interpret clinical data and write professional reports. D.4- Implement writing and presentation skills D.7- Demonstrate time management, problem solving and decision making skills
6. Be able to ask and answer questions within the research areas of Biochemistry.	B1. Evaluate the available data provided in the field of biochemistry and molecular biology. B3. Integrate accumulated knowledge and skills in biochemistry and biotransformation to suggest solutions for research and professional problems. D.3- Retrieve information from different information sources
7. Develop skills and abilities for effective teaching of Biochemistry in a course room setting.	**Covered through obligatory training courses delivered through the university staff development center**
8. Develop the skills and intellectual background to succeed at postdoctoral work in academics or in the commercial sector.	B1. Evaluate the available data provided in the field of biochemistry and molecular biology. B2. Select the appropriate analytical and diagnostic tool to assess endocrine disorders. B3. Integrate accumulated knowledge and skills in

	biochemistry and biotransformation to suggest solutions for research and professional problems. B.4. Suggest plans for enhancing performance in the field of biochemistry based on recent available evidence based information. B.5. Assess the laboratory hazards including the use of chemicals, research animals and experimental procedures. B.6. Design an original research project. C4- Elaborate different strategies to enhance practical work D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues D.6- Capable of self-evaluation and continuous learning for professional development
9. Demonstrate ethical conduct within the research process and the responsibilities of the scientist.	A.5 Illustrate basic principles of quality assurance in experimental and clinical researches A.7 Outline the ethical guideline in reporting data, citing literature and publishing a scientific reports in international journals.

4-Curriculum Structure and Contents:

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 area of biochemistry. 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-number of semesters: 2 semester

c- Study plan:

Course Code	Course Title	Credit hours	Program ILOs Covered	Exam duration
	Special Courses:			
BSp6	Regulation of gene expression	4	A1, A3, B1, B4, D2, D3, D5	4 hours
BSp4	Molecular endocrinology	4	A1, A3, B1, B2, D2, D3	4 hours
BSp5	Biotransformation	4	A1,A2, B1, B3, D2, D3, D5	4 hours

	Thesis	30	A1, A2, A3, A4, A5, A6, A7 , B1, B5, B6, B7, C1,C2,C3, C4, D1, D2, D3, D4, D5, D6, D7	30 hours

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 complete 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 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 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 the Graduate Studies and Research Committee for approval of cancellation.
3. Dissertation refusal by the Jury Committee.
4. 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
Presentation	Intellectual Skills and 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

8-Failure in Courses:

Students who fail to get 60% (1 point)

9-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Prof. Huda Elsayed	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Prof. Ola Sayed	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with ARS International Benchmark Questionnaires	**100%**

Program coordinator: Assis. Prof./ Nahla Younis

Head of Department: Assis. Prof./ Nahla Younis

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: 2019

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, signaling pathways related to gene expression, the application of gene expression and cell signaling data as well as skills necessary for proper professional practice.

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

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

4- Course Content of Regulation of Gene expression

Week number	Lecture contents (4hrs/week)
1	• Recall of Molecular Biology/Genetics- DNA, RNA and Protein synthesis
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

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

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

5	• Quick test 2 • Preparation for Journal Club (activity)
6	• Activity (review article) /discussion

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
8	• Drugs and gene expression (Acute versus chronic)
9	• Disease and gene expression (Acute versus chronic)
10	• Signaling pathways – basic principles • Principles underlying cell communication with a focus on G protein pathways
11	• Structure-function relationships and regulation of protein functions through phosphorylation • Structure/function relationships and regulation of protein function by phosphatases
12	• G Protein Signaling • Signal Transduction Through Ion Channels • Signals with Long-Term Consequences • Systems Biology of Signaling
13	• Signaling pathways that control gene expression • Test 3
14	• Activity (presentations) /discussion
15	• Final exam

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:

Assessment (1): Activity	Week 5-6-14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

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

A- **Essential books:**

Richard A. Harvey and Denise R. Ferrier: Lippincott's illustrated reviews: Biochemistry 5th edition 2011. Lippincott Williams & Wilkins, a Wolters Kluwer businessm, Philadelphia.

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

B- Suggested books:

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

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

Facilities required for teaching and learning:

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

- **Course Coordinators: : Prof Dr/ Sahar El-Swefy**

Date: تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ

Matrix I of Regulation of Gene expression (2019)

	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 (2018-2019)

NARS		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	

		A.3-Illustrate principles of tissue metabolism, abnormalities relevant to tissue metabolism	a1-a2-a3	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- 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 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- Drugs and gene expression (Acute versus chronic)- Disease and gene expression (Acute versus chronic)						

		A.3-Illustrate principles of tissue metabolism, abnormalities relevant to tissue metabolism	a4-a5	Signaling pathways – basic principles Principles underlying cell communication with a focus on G protein pathways- 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					

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	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- 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						

	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.	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	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use computer and statistical skills required for the preparation and submission of a complete research article	d1	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.	D.3- Retrieve information from different information 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.	D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues	d3	Preparation for Journal Club (activity) - Activity (review article) /discussion-presentations	Textbooks, Scientific papers and self learning	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: 2019

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

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

4. Course Content of Molecular endocrinology

Week number	Lecture contents (4hrs/week)
1	• Review of general endocrinology
2	• Introduce the field of molecular endocrinology and biomedical importance
3	• Hormones (Definition, general functions, classification)
4	• Transport of hormones • Storage of hormones
5	• Hormone receptors and regulation
6	Nuclear Receptors Hormone Receptors as Transcription Factors Post-transcriptional Gene Regulation Mechanism of action of steroidal hormones (Student presentation)
7	Receptor Regulation Membrane Receptors Cytokine Receptors Enzyme-linked Receptors and their actions (Student presentation)
8	• Mechanism of action of hormones that use cAMP as second messenger
9	• Mechanism of action of hormones that use cGMP as second messenger
10	• G Protein-Coupled Receptors and their actions • Calcium, Calmodulin and Phospholipids • Mechanism of action of hormones that use calcium and phospholipids as second messenger • Activity (review article)

11	• Molecular Aspect of hormonal regulation
12	• Diseases associated with hormone disorders
13	• Hormone therapy benefits and / or hazards
14	• Hormone therapy and targeted molecular therapy • Activity (presentations)
15	• Final exam

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
Activity assess: d1, d2

Assessment schedule:

Assessment (1): Activity	Week 6-7-10-14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %

• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

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 (29th 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, 8th edition, 2012. Hodder and Stoughton ltd, London.

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/ Sahar El-Swefy**
- **Date: / تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ**

Matrix I of Molecular endocrinology (2019)

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 calcium and phospholipids as second messenger Activity (review article)			x						
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
14	Revision, open discussion • Activity (presentations)	X	x	x	X	x	x	x	x	X

Matrix II of Molecular Endocrinology (2019)

NARS		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 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	Textbooks, Scientific papers and self learning	x	x	x	x	

				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						

		A.3 Outline updated research trends in the fields of biochemistry and molecular biology	a1-a2-a3-a4	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	Textbooks, Scientific papers and self learning	x	x	x	x	x

				hormones that use calcium and phospholipids as second messenger Molecular Aspect of hormonal regulation Diseases associated with hormone disorders						

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 and phospholipids as second messenger Molecular Aspect of hormonal regulation	Textbooks, Scientific papers and self learning	X	x	x	x	x

	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	
General and transferable skills	2.4.2- Efficiently use the information technologies (IT) in improving the professional practices.	D.2- Use computer and statistical skills required for the preparation and submission of a complete research article	d1	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.	D.3- Retrieve information from different information sources	d2	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	X	x			x

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: 2019

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, effects of xenobiotic processing on health as well as analysis of biotransformation information to conclude body processing of different xenobiotics and bioactivation causes.

3.Intended learning outcome s (ILOs) of Biotransformation

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

4- Course Content of Biotransformation (PhD degree)

Week number	Lecture contents (4hrs/week)
1	• Biotransformation (definition, biomedical importance)
2	• Biotransformation Reactions
3	• Phase I reactions
4	• Phase II reactions
5	• Phase III reactions, open discussion
6	• Biotransformation Sites
7	• Biotransformation Enzymes • Activity (review article)
8	• Induction of Biotransformation Enzymes
9	• Inhibition of Biotransformation Enzymes
10	• Applications of enzymes induction -Inhibition in pharmaceutical preparations
11	• Factors Affecting Biotransformation
12	• Bioactivation of xenobiotics

13	• Toxic effects of xenobiotics (i.e: carcinogenic, immunologic reactions, cell death…etc)
14	• Activity (presentation of review articles in journal club)
15	• Final exam

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

Activity assess: d1, d2, d3

Assessment schedule:

Assessment (1): Activity	Week 7-14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %

TOTAL	**100**	**100%**

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. Caira, 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 Jersy, 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 (29th edition), 2012; The Mc Graw Hill companies Inc., USA.

D- Websites: pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof Dr/ Mohamed Mahmoud ElSeweidy**
- **Date: تم اعتماد توصيف المقرر بمجلس قسم الكيمياء الحيوية بتاريخ**

Matrix I of Biotransformation (2019)

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
14	Revision and open discussion	x	X	x	x	x	x	x	X	x	X

Matrix II of Biotransformation (2019)

NARS		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	

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.	b2	Bioactivation of xenobiotics, toxic effects of xenobiotics	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.7- Take professional decisions and bears responsibility in wide array of pharmaceutical fields.	B3. Integrate accumulated knowledge and skills in biochemistry and biotransformation to suggest solutions for research and professional problems.	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.	D.2- Use computer and statistical skills required for the preparation and submission of a complete research article	d1	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.	D.3- Retrieve information from different information sources	d2	Revision and open discussion - Activity	Textbooks, Scientific papers and self learning	x	x			x
	2.4.3- Help others to learn and evaluate their performance.	D.5- Work effectively as a member or a leader of team and evaluate the performance of colleagues	d3	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
- **Department offering the thesis:** Biochemistry
- **Date of specification approval:** 2019

1- Basic information:

Title: PhD Thesis in Biochemistry
Credit hours: 30 hrs

2- Overall aim of the thesis:

This Program aims at extending the knowledge and skills of postgraduate master students in the field of biochemistry to apply to the provision in various settings including research Institutes, private and public hospitals and universities.

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	
a1	Illustrate advanced bases of biochemistry, genetics, and medication safety related to main objectives of the thesis
a2	Identify therapy guidelines as well as ethics of clinical research
a3	Understand the legal aspects of for professional and academic practices
a4	Define patients' rights and quality assurance bases related to practical work of the thesis
Intellectual skills	
b1	Solve problems related to practical work by obtained quantitative data from the practical work
b2	Discuss professional problems and suggest solutions relay on different pharmaceutical knowledge and recent information
b3	Plan a research in the field of pharmacy practice that allow discovery of new therapy guidelines and strategies for effective and safe treatment
b4	Integrate scientific results and write report following conducting research
b5	Manage risks and hazards related to professional practical area
b6	Adopt GLP principles in research to develop laboratory performance
b7	Decide what to do with full responsibility in scientific research
b8	Demonstrate creativity and innovation in modifying techniques and in utilization of various therapies.

b9	Manage evidence based arguments in the field of biochemistry
Professional and practical skills	
c1	Apply recent techniques related to practical thesis work.
c2	Use and evaluate practical data to write report
c3	Develop methods of data collection
c4	Apply technology in methodology development during practical work. Use IT skills in collecting information, presenting results and writing thesis
c5	Modify laboratory techniques.
General and Transferable skills	
d1	Interact with health care professionals and patients.
d2	Use information technology in review and thesis preparation
d3	Set rules for evaluation and judge others performance.
d4	Study independently and evaluate learning needs in biochemistry
d5	Reprocess up-to-date information in pharmacy practice
d6	Implement tasks as a member of a team.
d7	Utilize time effectively to achieve goals
d8	Work effectively as leader of a team
d9	Able to present data orally and participate in workshops and conferences
d10	Transfer theoretical/practical experience to junior researches

4. Thesis Content:

Steps	Content
1st	-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. -Collect recent information about this subject by all possible means. -Use internet, journals, books and others thesis to get previous and recent information about the subject understudy. -Design the protocol including the steps of work following the suitable timetable. -Integrate different knowledge (pharmacological knowledge, pharmacotherapy, biostatistics, genetics……..) to solve suggested problem. -Continuous evaluation to the thesis outcome according to the schedule.

2nd	-Identify different practical techniques and methods to collect data related to the subject under study. -Operate scientific instruments according to instructions and GLP basics when necessary. -Evaluate and manage hazards (chemical and biological) throughout the whole practical work. -Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments). -Perform lab examination, gene analysis, radiographically imaging, others -Apply ethical recommendations during dealing with humans/ experimental animals
3rd	-Collect raw data of patients demographics, medication administered , side effects and others -Interpret raw data to get valuable information. -Perform statistical analysis for the results. -Present and describe the results graphically. -Suggest solution to the problem understudy based on this presented data.
4th	-Communicate with supervisors to discuss results -Work effectively as a member of a team (e.g. Supervisors, various professionals, patients and Technicians). -Present the results periodically in seminars.

	-Define ethics of clinical research. -Write scientific reports on the obtained results with conclusive significance. -Discuss obtained results in comparison with pervious literatures. -Suggest possible recommendations based on the outcome of the thesis and decide future plans. -Summarize the thesis in an understandable Arabic language for non professionals. -Write references in the required form (Thesis, Paper…….). -Demonstrate the thesis in a final power point presentation. -Continue self-learning throughout the experimental work and writing scientific papers.
5th	- Prepare research paper(s) for publication in national/international journals. - Participate in national/international conferences to present the findings of his/her thesis.

5- Teaching and Learning Methods:

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

6- References:

1. Berend K, de Vries AP, Gans RO. Physiological approach to assessment of acid-base disturbances. N Engl J Med 2014;371:1434-45.

2. Jacobi J, Bircher N, Krinsley J, et al. Guidelines for the use of an insulin infusion for the management of hyperglycemia in critically ill patients. Crit Care Med 2012;40:3251-76.

Facilities required for:

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

Zagazig University Hospital

Head of Department: Assis. Prof

		PhD of Biochemistry (2019)																								
Program Courses			Program intended learning outcomes																							
		Knowledge and understanding							Intellectual skills							Professional and practical skills				General and transferable skills						
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3	D4	D5	D6	D7
Special courses	Regulation of gene expression	√		√					√			√									√	√		√		
	Molecular endocrinology	√		√					√	√											√	√				
	Biotransformation	√	√						√		√										√	√		√		
Thesis		√	√	√	√	√	√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√