Program and Course Specifications

PhD Degree

Program Specification

Program Specification

A- Basic Information

1- Program title: PhD. Pharm. Sci Degree in **Pharmaceutical Organic Chemistry**

2- Program type: Monodisciplinary.

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

4- Department: Pharmaceutical Organic Chemistry

5- Coordinator: Prof. Dr./ Aza M. Kadry and Prof. Dr./ Said A. H. El-Feky

6- Date of program specification approval: 2019

7- Teaching language: English

8- External Evaluator: Prof. Dr. Manal Kandil (Cairo University)

9- Internal Evaluator: Prof. Dr. Eatedal H. Abdel aal

10- 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 special courses were compared with postgraduates organic courses in: Carleton University, Canada
kansas University, USA
University of Palacky Olomouc, Czech Republic (EU)

B- Professional Information

Program aims:

1-1 To provide **the doctoral** students with a special and advanced education in the field of **Pharmaceutical Organic Chemistry.**

1-2 To develop the skills of researchers to become professionals and leaders in scientific research.

Graduate Attributes:

The PhD of Pharmaceutical Organic Chemistry aims to provide graduates with the opportunity to develop the following attributes, upon successful completion of the program, the graduate will be able to:

1- Acquire knowledge in advanced chemical instrumentations for detection of chemical structure.
2- Apply knowledge of various organic reactions in drug synthesis.
3- Illustrate combinatorial chemistry in drug discovery.
4- Contribute to scientific heritage by publishing research in specialized journals for pharmaceutical organic chemistry.
5- Demonstrate a high level of critical thinking, problem solving and decision making skills as a member of the research team.
6- Show Self-motivation, attention to detail, time-management and communication skills
7- Ask questions, create research hypotheses, and design methodologies to answer research questions.
8- Perform self-directed learning.

2-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for **Pharmaceutical Organic Chemistry** PhD of science degree.

2-1 - Knowledge and Understanding:

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

A.1 - Demonstrate in-depth knowledge and understanding of application of named reactions in pharmaceutical organic synthesis as well as Current Trends in Pharmaceutical Organic Chemistry.

A.2- Outline fundamentals, methods, techniques, tools and ethics of scientific research.

A.3-Describe legal authorities for professional practices in pharmacy and academic practices.

A.4-Determine the bases of quality assurance in synthetic pharmaceutical organic chemistry.
A.5- Identify the beneficial impact and applications of organic chemistry towards a safe environment.

2-2 - Intellectual Skills:

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

B.1- Analyze, evaluate and discuss information and results in the field of synthesis of pharmaceuticals.

B.2- Integrate theoretical background in organic chemistry to overcome emerging difficulties in the research process.

B.3- Construct a research study in the field of synthesis of pharmaceuticals.

B.4- Manage risks during dealing with chemical reagents.

B.5 - Improve a laboratory schemes for an advanced organic chemistry issue.

B.6 - Take professional decisions regarding emerging situations in the field of pharmaceutical synthesis.

B.7 - Demonstrate creativity and innovation in the field of pharmaceutical organic chemistry.

2-3 - Professional and Practical Skills:

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

C.1- Implement laboratory techniques for synthesis and purification of the target pharmaceuticals.

C.2- Write reliable scientific reports and conclusions in organic chemistry.
C.3 - Work safely and efficiently in a laboratory.

C.4 - Select appropriate methods and tools to support goals.
C.5 - Use the most recent techniques to improve performance.

2-4 - General and Transferable Skills:

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

D.1- Communicate effectively with colleagues and a wider audience in a variety of media.

D.2- Improve professional practices using the information technology.
D.3- Guide others to learn and evaluate their performance.

D.4 - Capable of self-evaluation and continue to learn independently to develop professionally.

D.5 - Use computer and internet skills to get information and knowledge.

D.6 - Activate working as a member of a team.
D.7 - Run time successfully to reach goals.

3- Academic Standards:

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

	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 - Demonstrate in-depth knowledge and understanding of application of named reactions in pharmaceutical organic synthesis as well as Current Trends in Pharmaceutical Organic Chemistry.

	2.1.2 - Fundamentals, methods, techniques, tools and ethics of scientific research	A.2- Outline fundamentals, methods, techniques, tools and ethics of scientific research.
	2.1.3 - The ethical and legal principles in pharmacy and academic practices	A.3-Describe legal authorities for professional practices in pharmacy and academic practices.
	2.1.4 - The principles and bases of quality assurance in professional practice in the field of specializations	A.4-Determine the bases of quality assurance in synthetic pharmaceutical organic chemistry.
	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.5- Identify the beneficial impact and applications of organic chemistry towards a safe environment.
Intellectual Skills	2.2.1 - Analyze, evaluate the data in his / her specified area, and utilize them in logical inference processes (induction/deduction).	B.1- Analyze, evaluate and discuss information and results in the field of synthesis of pharmaceuticals.
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Integrate theoretical background in organic chemistry to overcome emerging difficulties in the research process.

	2.2.3 - Conduct research studies that add to the current knowledge.	B.3- Construct a research study in the field of synthesis of pharmaceuticals.
	2.2.4 - Formulate scientific papers.	
	2.2.5 - Assess hazards and risks in professional practice in his / her area of specialization.	B.4 - Manage risks during dealing with chemical reagents.
	2.2.6 - Plan to improve performance in the pharmaceutical area of interest.	B.5 - Improve a laboratory schemes for an advanced organic chemistry issue.
	2.2.7 - Take professional decisions and bears responsibility in a wide array of pharmaceutical fields	B.6 - Take professional and scientific decisions regarding emerging situations in the field of pharmaceutical synthesis.
	2.2.8 - Be creative and innovative	B.7 - Demonstrate creativity and innovation in the field of pharmaceutical organic chemistry.
	2.2.9 - Manage discussions and arguments based on evidence and logic.	B.1- Analyze, evaluate and discuss information and results in the field of synthesis of pharmaceuticals.
Professional and Practical	2.3.1 - Master basic and modern professional skills in the area of specialization.	C.1- Implement laboratory techniques for synthesis and purification of the target pharmaceuticals.

	2.3.2 - Write and critically evaluate professional reports.	C.2- Write reliable scientific reports and conclusions in organic chemistry.
	2.3.3 - Evaluate and develop methods and tools existing in the area of specialization.	C.4 - Select appropriate methods and tools to support goals.
	2.3.4 - Properly use technological means in a better professional practice	C.3 - Work safely and efficiently in a laboratory.
	2.3.5 - Plan to improve professional practices and to improve the performance of other scholars	C.5 - Use the most recent techniques to improve performance.
General and Transferable Skills	2.4.1 - Effective communication in its different forms	D.1 - Communicate effectively with colleagues and a wider audience in a variety of media.
	2.4.2 - Efficiently use the information technologies (IT) in improving the professional practices	D.2 - Improve professional practices using the information technology.
	2.4.3 - Help others to learn and evaluate their performance.	D.3 - Guide others learn and evaluate their performance.
	2.4.4 - Self-assessment and continuous working.	D.4 - Capable of self-evaluation and continue to learn independently to develop professionally.
	2.4.5 - Use various sources to get information and knowledge.	D.5 - Use computer and internet skills to get information and knowledge.
	2.4.6 - Work as a member and lead a team of workers	D.6 - Activate working as a member of a team.

	2.4.7-Direct scientific meetings and to manage time effectively	D.7 - Run time successfully to reach goals.

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 area of Pharmacy Practice. To fulfill this requirement the student must present (written and oral) 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
	Special Courses:		
Osp4	Strategic Application of Named Reaction in Pharmaceutical Organic Synthesis	4	A1, B2, B5, D1, D2, D4, D7.
Osp5	The Organic Chemistry in Drug Synthesis	4	A1, B1, B3, D1, D2, D4, D5, D7.
Osp6	Current Trends in Pharmaceutical Organic Chemistry	4	A1, A2, A3, B5, B6, D1, D2, D4, D5, D7.
	Thesis	30	A1, A2, A3, A4, A5, B1, B2,B3, B4, B5, B6, B7, C1, C2, C3,C4, C5, D1, D2, D3, D4, D5, D6, D7.

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 pharmacy 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 non attendance 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

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%
F	1	< 60%

8-Failure in Courses:

Students who fail to get 60% (1 point)

9-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Prof. Dr. Eatedal H. Abdel aal	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Prof. Dr. Manal Kandil (Cairo University)	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator: Prof. Dr./ Azza M. Kadry and Prof. Dr. Said A. H. El-Feky

Head of Department: Prof. Dr./ Hanan Abd El-Razik

تم اعتماد التوصيف بمجلس الكلية بتاريخ 2019

Strategic Application of Named Reaction in Pharmaceutical Organic Synthesis

Course specification of Strategic Application of named reaction in pharmaceutical organic synthesis

A- Course specifications:

- Program on which the course is given: PhD of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutical organic chemistry
- Department offering the course: Pharmaceutical organic chemistry
- Date of specification approval: 2019
- The course was benchmarked with a course delivered by Carleton University, Canada

1- Basic information:

Title: **Strategic Application of named reaction in pharmaceutical organic synthesis** Code: Osp4

Credit hours: 4 hrs/week Lectures: 4 hrs/week

Total: 4 hrs/week

2- Overall aim of the course:

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

- Identify various named organic reactions.
- Verify the mechanism of several named reactions.
- Apply the named reactions in the synthesis of some pharmaceutically active compounds.

3. Intended learning outcomes (ILOs) of Strategic application of named reaction in pharmaceutical organic synthesis:

Knowledge and Understanding	
a1	Enumerate various applicable named organic reactions.
a2	Describe the mechanisms of different named reactions.
a3	Mention different synthetic examples related to named reactions.
Intellectual skills	
b1	Predict the mechanism of named reactions.
b2	Evaluate the role of each reagent in a given named reactions.
General and Transferable skills	
d1	Contact effectively with professionals.
d2	Deals with computer and internet skills.
d3	Restore information from different sources.
d4	Run time successfully.
d5	Get independent learning.

4. Course Content of Strategic application of named reaction in pharmaceutical organic synthesis:

Week number	**Lecture contents (4hrs/week)**
1	Named reactions starting with the letters A&B
2	Named reactions starting with the letters C&D
3	Named reactions starting with the letters E&F
4	Named reactions starting with the letters G&H
5	Named reactions starting with the letters I&J
6	Named reactions starting with the letter K
7	Named reactions starting with the letter L **(Activity, problem solving)**
8	Named reactions starting with the letter M
9	Named reactions starting with the letter N

10	Named reactions starting with the letter O
11	Named reactions starting with the letters P&Q
12	Named reactions starting with the letter R
13	Named reactions starting with the letter S
14	Named reactions starting with the letters T,U,V,&W Named reactions starting with the letters X,Y,&Z
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Problem solving
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1 and b2
Oral exam to assess: a1, a2, a3, b1 and b2
Activity to assess: d1, d2, d3, d4and d5
Assessment schedule:

Assessment (1): Activity	Week 7
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

B- Essential books:

Kurti, L., & Czakó, B. (2005). *Strategic applications of named reactions in organic synthesis*. Elsevier.

Li, J. J. (Ed.). (2004). *Name reactions in heterocyclic chemistry* (Vol. 3). John Wiley & Sons.

Mundy, B. P., Ellerd, M. G., & Favaloro Jr, F. G. (2005). *Name reactions and reagents in organic synthesis*. John Wiley & Sons.

C- Websites:

www.sciencedirect.com
www.Pubmed.com
www. Ekb.eg

Facilities required for teaching and learning:

1. **For lectures:** boards, data show, screen, air conditioned class.

- **Course Coordinators: Prof Dr/ Azza Kadry, Said El Fiky**
- **Head of Department: Prof Dr/ Hanan Abdel Razik**
- **Date: 2019 -8 -27**

Matrix I of Strategic Application of Named Reaction in Pharmaceutical Organic Synthesis 2019

Week number	Course Contents	Knowledge and understanding			Intellectual skills		General and Transferable skills				
		a1	**a2**	**a3**	**b1**	**b2**	**d1**	**d2**	**d3**	**d4**	**d5**
1	Named reactions starting with the letters A&B	x	x	x	X	x					
2	Named reactions starting with the letters C&D	x	x	x	X	x					
3	Named reactions starting with the letters E&F	x	x	x	X	x					
4	Named reactions starting with the letters G&H	x	x	x	X	x					
5	Named reactions starting with the letters I&J	x	x	x	X	x					

6	Named reactions starting with the letter K	x	x	x	X	x					
7	Named reactions starting with the letter L**(Activity)**	x	x	x	X	x	x	x	x	X	x
8	Named reactions starting with the letter M	x	x	x	X	x					
9	Named reactions starting with the letter N	x	x	x	X	x					
10	Named reactions starting with the letter O	x	x	x	X	x					
11	Named reactions starting with the letters P&Q	x	x	x	X	x					
12	Named reactions starting with the letter R	x	x	x	X	x					
13	Named reactions starting with the letter S	x	x	x	X	x					
14	Named reactions starting with the letters T,U,V,&W Named reactions starting with the letters X,Y,&Z	x	x	x	X	x					

The Organic Chemistry in Drug Synthesis

Course specification of The Organic Chemistry in Drug Synthesis

A- Course specifications:

- Program on which the course is given: PhD of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutical organic chemistry
- Department offering the course: Pharmaceutical organic chemistry
- Date of specification approval: 2019
- The course was benchmarked with **kansas University, USA**

1- Basic information:

Title: **The Organic Chemistry in Drug Synthesis**
Code: Osp5
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 the synthesis of most of the drugs.
- Demonstrate a strong ability to undergo synthetic organic chemistry with some exposure to modern biology.

3. Intended learning outcomes (ILOs) of The Organic Chemistry in Drug Synthesis:

Knowledge and Understanding	
a1	Outline synthetic routes toward aliphatic, aromatic and heterocyclic drugs.
a2	Illustrate the importance of aliphatic, aromatic and heterocyclic moieties as cores for therapeutic agents.
Intellectual skills	
b1	Propose a facile route to know drugs.
b2	Evaluate the role that heterocyclic moieties play in the biological activity beyond simply providing a basic center for a good many agents.
General and Transferable skills	
D1	Contact effectively with professionals.
D2	Deals with computer and internet skills.
D3	Restore information from different sources.
D4	Run time successfully.
D5	Get independent learning.

4. Course Content of The Organic Chemistry in Drug Synthesis:

Week number	Lecture contents (4hrs/week)
1	Open-chain compounds
2	Alicyclic compounds
3	Compounds related to progesterone, cortisone and cholesterol
4	Monocyclic aromatic compounds
5	Carbocyclic compounds fused to benzene ring
6	Five-membered heterocycles
7	Six-membered heterocycles **(Activity)**
8	Five-membered heterocycles fused to one benzene ring

9	Six-membered heterocycles fused to one benzene ring
10	Bicyclic fused heterocycles
11	Polycyclic fused heterocycles
12	Opioid analgesics
13	Seven-membered heterocycles fused to benzene ring
14	Heterocycles fused to two aromatic rings and Beta lactam antibiotics
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exam to assess: a1, a2, b1 and b2
Oral exam to assess : a1, a2, b1 and b2
Activity to assess: d1, d2, d3, d4, d5

Assessment schedule:

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

Weighting of Assessment:

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

7- References and books:

A-Scientific papers

B- Essential books:

Lednicer, D. (2007). *The organic chemistry of drug synthesis* (Vol. 8). John Wiley & Sons.

Nadendla, R. R. (2007). *Principles of organic medicinal chemistry*. New Age International.

Beale, J. M., Block, J., & Hill, R. (2010). *Organic medicinal and pharmaceutical chemistry*. Philadelphia: Lippincott Williams & Wilkins.

C-Suggested books:

Principle of organic medicinal chemistry, Rama Rao Nadendla, 2005

D- Websites: Pubmed, Sciencedirect

Facilities required for teaching and learning:

1. **For lectures:** boards, data show, screen, air conditioned class

- **Course Coordinators: Prof Dr/ Azaa Kadry, Prof Dr/ Said El Fiky**
- **Head of Department: Prof Dr/ Hanan Abdel Razik**
- **Date: 2019 -8 -27**

Matrix I of The Organic Chemistry in Drug Synthesis 2019										
Week number	Course Contents	Knowledge and understanding		Intellectual skills		General and Transferable skills				
		a1	**a2**	**b1**	**b2**	**d1**	**d2**	**d3**	**d4**	**d5**
1	Open-chain compounds	x								
2	Alicyclic compounds	x								
3	Compounds related to progesterone, cortisone and cholesterol		x	X						

4	Monocyclic aromatic compounds	x								
5	Carbocyclic compounds fused to benzene ring	x								
6	Five-membered heterocycles	x								
7	Six-membered heterocycles	x				x	x	x	x	x
8	Five-membered heterocycles fused to one benzene ring	x								
9	Six-membered heterocycles fused to one benzene ring	x								
10	Bicyclic fused heterocycles	x								
11	Polycyclic fused heterocycles	x								
12	Opioid analgesics		x		x					
13	Seven-membered heterocycles fused to benzene ring	x								
14	Heterocycles fused to two aromatic rings and Beta lactam antibiotic	x								

Current Trends in Pharmaceutical Organic Chemistry

Course specification of Current Trends in Pharmaceutical Organic Chemistry

A- Course specifications:

- Program on which the course is given: PhD of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutical organic chemistry
- Department offering the course: Pharmaceutical organic chemistry
- Date of specification approval: 2019

The course was benchmarked with **University of Palacky Olomouc, Czech Republic (EU)**

1- Basic information:

Title: **Current Trends in Pharmaceutical Organic Chemistry**
Code: Osp6
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:

- Apply combinatorial chemistry in the synthesis of drug libraries.
- Utilize click chemistry in pharmaceutical organic synthesis.

3. Intended learning outcome s (ILOs) of Current Trends in Pharmaceutical Organic Chemistry:

Knowledge and Understanding	
a1	Illustrate the fundamentals of combinatorial chemistry and outline the operating principles associated with its most widely practiced forms.
a2	Point out the use of combinatorial chemistry technologies in pharmaceutical applications.
a3	Define the concept of click chemistry and demonstrate its potential value as a universal ligation strategy for drug synthesis and material science.
Intellectual skills	
b1	Recognize combinatorial chemistry as a powerful tool for drug discovery.
b2	Consider the use of click chemistry in drug synthesis.
General and Transferable skills	
d1	Contact effectively with professionals.
d2	Deals with computer and internet skills.
D3	Restore information from different sources.
D4	Run time successfully.
D5	Get independent learning.

4. Course Content of Current Trends in Pharmaceutical Organic Chemistry:

Week number	Lecture contents (4hrs/week)
1	Introduction to combinatorial chemistry
2	Solid phase polymers for combinatorial chemistry
3	Linkers for solid phase synthesis
4	Encoding technologies
5	Instrumentation for combinatorial chemistry
6	Radical reactions in combinatorial chemistry

7	Nucleophilic substitution in combinatorial and solid phase synthesis **(Activity)**
8	Electrophilic substitution in combinatorial and solid phase synthesis
9	Elimination chemistry in the solution and solid phase synthesis
10	Combinatorial chemistry of the carbonyl group
11	Pharmaceutical applications of combinatorial chemistry
12	Introduction to click chemistry
13	Cupper catalyzed click chemistry
14	Non-cupper catalyzed click chemistry and Pharmaceutical applications of click chemistry
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning

Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1 and b2
Oral exam to assess: a1, a2, a3, b1 and b2
Activity to assess: d1, d2, d3, d4, d5

Assessment schedule:

Assessment (1): Activity	Week 7
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
B- Essential books:

Lahann, J. (Ed.). (2009). *Click chemistry for biotechnology and materials science*. John Wiley & Sons.
Hemming, K. (2001). Combinatorial chemistry: synthesis, analysis and screening. Edited by G Jung, Wiley-VCH, Chichester, 1999, 3 527 29869 X (hardback) xxxii+ 601 pp, UK£ 95.00. *Journal of Chemical Technology & Biotechnology*, *76*(4), 439-439.
Jung, G. (Ed.). (2008). *Combinatorial chemistry: synthesis, analysis, screening*. John Wiley & Sons.

- **Websites/Journals:**
- www.sciencedirect.com, Pubmed.

Facilities required for teaching and learning:

1. **For lectures:** boards, data show, screen, air conditioned class

- **Course Coordinators: Prof Dr/ Azza Kadry, Prof Dr/Said El- Feky**
- **Head of Department: Prof Dr/ Hanan Abdel Razik**
- **Date: 2019 -8 -27**

Matrix I of Current Trends in Pharmaceutical Organic Chemistry 2019

Week number	Course Contents	Knowledge and understanding			Intellectual skills		General and Transferable skills				
		a1	**a2**	**a3**	**b1**	**b2**	**d1**	**d2**	**d3**	**d4**	**d5**
1	Introduction to combinatorial chemistry	x			x						
2	Solid phase polymers for combinatorial chemistry	x	x	x	x						
3	Linkers for solid phase synthesis	x	x		x						
4	Encoding technologies	x	x		x						
5	Instrumentation for combinatorial chemistry	x	x		x						
6	Radical reactions in combinatorial chemistry	x			x						
7	Nucleophilic substitution in combinatorial and solid phase synthesis	x			x		x	x	x	x	x
8	Electrophilic substitution in combinatorial and solid phase synthesis	x			x						
9	Elimination chemistry in the solution and solid phase synthesis	x			x						
10	Combinatorial chemistry of the carbonyl group	x			x						
11	Pharmaceutical applications of combinatorial chemistry	x			x						
12	Introduction to click chemistry			x		X					
13	Cupper catalyzed click chemistry			x		X					
14	Non-cupper catalyzed click chemistry and Pharmaceutical applications of click chemistry			x		X					

Thesis Specification

Thesis Specification of PhD Degree

A- Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical sciences (Pharmaceutical Organic Chemistry)
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutical Organic Chemistry Dept.
- **Department offering the thesis:** Pharmaceutical Organic Chemistry Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: PhD Thesis in Pharmaceutical Organic Chemistry

Credit hours: 30 hrs

2- Overall aim of the thesis:

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
- Identify and perform different 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
- Draw conclusions about the contribution to knowledge made by the study which may be concerned with the problem under investigation, the methods deployed or the student as researcher

3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
a1	Illustrate fundamentals and advanced knowledge in the field of Pharmaceutical organic chemistry that help to better understand the subject understudy.
a2	Determine methods, tools and techniques used during work.
a3	Carry out professional duties in accordance with legal and ethical guidelines.
a4	Define and apply quality bases during practical work.
a5	Describe the purpose of the research work and its impact on the community and human health.
Intellectual skills	
b1	Analyze and interpret the experimental data in a suitable form to utilize them properly.
b2	Propose a solution to the point understudy depending on available data.
b3	Carry out the research to add to the area of study.
b4	Develop writing skills such as clarity and presenting results to formulate scientific papers.
b5	Manage risks during dealing with chemical reagents.
b6	Improve the performance during the practical work.
b7	Make decisions related to recent and future studies.
b8	Be creative, innovative and original in one's approach to research.
b9	Discuss by theoretical evidences the whole work results.
Professional and practical skills	
c1	Perform practical experiments related to the point understudy.
c2	Report the work in a written report.
c3	Select appropriate methods and tools to support goals.
c4	Consider developments in technology and how to use to enhance learning.
c5	Improve the performance during the practical work.

General and Transferable skills	
d1	Communicate effectively in different forms.
d2	Be competent in the use of computers for data analysis, word-processing, and production of thesis-quality graphics.
d3	Evaluate the performance of others and assist them to develop.
d4	Recognize self-limitations and areas for improvement and seek for continuous learning.
d5	Gather, summarize, and organize information from different sources.
d6	Implement tasks as a member of a team.
d7	Utilize time effectively to achieve goals.

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 related to the problems of the community and surrounding environment. • Collect all available 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. • Increase the awareness of the recent chemical techniques that will be used during practical work and determined by the protocol. • Integrate different knowledge required to solve suggested problem.

	• Continuous evaluation to the thesis outcome according to the schedule.
2nd	• Identify different practical techniques and methods to assess chemical reactions related to the subject under study. • Modify methods and experiments used during practical work. • Evaluate and manage chemical hazards throughout the whole practical work. • Organize the experimental work according to the designed protocol. • Apply spectroscopic analysis for the new expected compounds (IR, ^{1}HNMR, Mass and elemental analysis). • Predict synthetic pathways and mechanisms. • Use all possible means to prove target compounds. • Apply ethical recommendations in all aspects of scientific research e.g. citation, publication……
3rd	• Select some of the compounds for their pharmacological or microbiological activities. • Interpret the biological results. • Perform statistical analysis and biological correlation for the results. • Present and describe the results graphically. • Understand any legal aspects related to the thesis work especially those related to dealing with chemicals.
4th	• Communicate with supervisors to discuss results. • Work effectively as a member of a team (e.g. Supervisors and various professionals). • Present the results periodically in seminars.

	• 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. • Present the thesis in a written form. • 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.

5- Teaching and Learning Methods:

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

6- References:

- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for:

For practical work: Heaters with magnetic stirrer- UV lamp- Rotary evaporator- Ice machine- Infrared- 1HNMR- Mass Spectrometer- Vacuum pump

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- **Head of Department: Prof. Dr. Hanan Abdel Razik**