

Republic of Yemen

Ministry of Higher Education & Scientific Research

21 September University for Medicals and Applied Sciences



Faculty of Clinical Pharmacy

Bachelor of Clinical Pharmacy & Pharm. D.

Course Specification of **Pharmaceutical Organic Chemistry-I**

Course No. (02.04.244)

2022

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
Prof. Ali Alkaf	Prof. Mukhtar Al-Gharafi Dr. Abdulalah Thabet	Dr. -----	Dr. Abdulalah Thabet	Dr. Ali Alyahawi

I. Course Identification and General Information:

1	Course Title:	Pharmaceutical Organic chemistry I			
2	Course Code & Number:	02.04.244			
3	Credit hours:	C.H			
		Th.	Seminar	Pr	Tr.
		2		2	
4	Study level/ semester at which this course is offered:	2 nd Year- 1 st Semester			
5	Pre –requisite (if any):	General chemistry			
6	Co –requisite (if any):	None			
7	Program (s) in which the course is offered:	Bachelor of Clinical Pharmacy & Pharm. D.			
8	Language of teaching the course:	English			
9	Study System	Semester based System			
10	Mode of delivery:	Regular-Full Time			
11	Location of teaching the course:	Faculty of Clinical Pharmacy			
12	Prepared By:	Prof. Ali Alkaf			
13	Date of Approval				

Course Description:

The organic pharmaceutical chemistry part is designed to provide students with the basic knowledge of aliphatic compounds, include the physical and chemical properties, chemical reactions, methods of preparation and mechanisms including the structural formula of drugs and to prepare them to understand other courses such as biochemistry, medicinal chemistry, photochemistry, pharmacokinetics and pharmacodynamics.

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II. Course Intended learning outcomes (CILOs)		Referenced PILOs Learning out of program
A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:		
a.1	Define basic principles in pharm. org. chem. especially aliphatic organic compounds such as alcohols, carbonyl and others	A2
a.2	Describe the principles of identification of functional groups in organic compounds or chemical mechanisms and their application in the synthesis of simple medicinal agents.	A4
B. Intellectual Skills: Upon successful completion of the course, students will be able to:		
b.1	Design the methods of synthesis and properties of medicinal agents and critical problems that may be encountered in pharmaceutical organic chemistry application.	B1
b.2	Explaining the mechanisms of reaction and effect of condition on the type of products.	B2
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:		
c.1	Identify organic compounds from their physical and chemical properties by analysis of functional groups of compounds.	C2
c.2	Choose and select key starting in the synthesis of compounds or simple drugs.	C2
D. Transferable Skills: Upon successful completion of the course, students will be able to:		
d.1	Ability to make an organic reaction using scientific procedures	D3
d.2		

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1-Define basic principles in pharm. org. chem. especially aliphatic organic compounds such as alcohols, carbonyl and others	Lecture and class discussions	Written examination

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a2- Describe principles of identification of functional groups in organic compounds or chemical mechanisms and their application in the synthesis of simple medicinal agents.	Lecture and problem solving	Written examination and evaluation of problem solving
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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Design the methods of synthesis and properties of medicinal agents and critical problems that may be encountered in pharmaceutical organic chemistry application	Lecture and class discussion	Written and oral examination
b2- Explaining the mechanisms of reaction and effect of condition on the type of products.	Lecture, problem solving and practical classes	Written, practical examination and evaluation of solved problems.

C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
C1- Identify organic compounds from their physical and chemical properties by analysis of functional groups of compound	Practical classes, assignments	Written and practical examinations
C2- Choose and select key starting in the synthesis of compounds or simple drugs	Lecture, problem solving and practical classes	Written examinations and evaluation of practical classes

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Ability to make an organic reaction using scientific procedures.	Interactive class discussions and office hours (Tutorial)	Written examinations based on problem solving
d2--Use the principal rules to solve problem and questions related the course	Problem solving and report	Written examinations and evaluation based on problem solving

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III. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Subtopics List	Number of Weeks	contact hours
1	Introduction to Pharmaceutical Organic Compounds:	a1, a2, b2	Introduction, solubility , type of chemical bonds, -hybridization and their types, chemical bonding in drug–receptor interactions, - type of isomerisms, Types chemical bond cleavage mechanisms, The effect of cleavage of bond in drug stability,	2	4
2	Stereochemistry and Organic reactions	a2-b1, b2, d1	Model structure that used to draw organic molecules.	3	6
3	Alkanes	a1, a2, b1, b2, c1, d1	Nomenclature, preparations, and reaction properties), Pharmaceutical importance of alkane (activity ,stability)	1	2
4	Midterm Exam	a1-a2, b1, b2, ,c1,d1		1	2
5	Alkenes and alkynes	a1-a2, b1, b2, c1, d1	Alkenes and cycloalkenes (nomenclature, preparations, and reaction properties), elimination & addition reaction mechanism Pharmaceutical importance of alkene (Isomers , activity ,stability Alkynes (nomenclature, preparations, and properties), acidity of acetylene, p hysical and chemical properties of al kyne group in drug structure.	2	4
6	Organic halides	a1-a2, b1, b2, c1,d1	Alkyl halides (nomenclature, preparations, and properties), Nucleophilic substitution reactions	1	2

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			mechanism, and reactions of organometallic compounds. Pharmaceutical importance of alkyl halide in drug synthesis.		
7	Alcohols , Ethers	a1-a2, b1, b2 ,c1,d1,d2	-Alcohols (nomenclature, preparations, and properties), esterification reaction mechanisms – Ethers (nomenclature, preparations, and properties), physical and chemical properties of drugs contain alcohol functional group(prodrug),	3	6
8	Amines	a1-a2, b1, b2 ,c1,d1,d2	Aliphatic and aromatic amines (nomenclature, preparations, and properties), factors affecting on the acidity of drugs	2	1
9	Final Exam	a1-a2, b1, b2 , c1,d1		1	2
Number of Weeks /and Units Per Semester				16	36

B - Practical Aspect: (if any)				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Laboratory safety	1	2	C1, C2
2	Test of alcohols	1	2	C1, C2
3	Test of aldehydes	1	2	C1, C2
4	Test of ketones	1	2	C1, C2
5	Test of acids and their derivatives	2	4	C1, C2
6	Test of ammonium salt	2	4	C1, C2
7	Lasagna's test, test for nitrogen	1	2	C1, C2

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8	Midterm Exam	1	2	c1, c2
9	Test for sulfur	1	2	c1, c2
10	Test for halogen in absence of nitrogen and sulfur	1	2	c1, c2
11	Revision	1	2	c1, c2
12	Final Exam	1	2	c1, c2
Number of Weeks /and Units Per Semester		14 week	28	

V. Teaching strategies of the course:

- Lectures
- Assignment and reports small group discussion sessions
- Problem solving methods presentations

VI. Assignments:

No	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Assignment 1: One home assignment after each lecture	a1, c1, c2, d1	Week 3-14	5
2	Assignment 2: Group assignment	a1, c1, c2, d1	Week 7, 14	5
	Total			10

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	CILOs
1	Assignments	Week 3-14	10	10%	a1, c1, c2, d1
2	Midterm Exam	8	20	20%	a1, c1, c2, d1
3	Practical Exam	12	20	20%	c1, c2
4	Final Exam	16	50	50%	a1, a2. c1
	Total		100	100%	

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VIII. Learning Resources:	
Required Textbook(s) (maximum two).	
	1. J. Mc-Murry (2014). Organic Chemistry, 8 th edition. 2. Harold Hart, Leslie E. Craine, David J. (January 1999). Organic Chemistry: A Short Course.; 10th edition ISBN. Hart. Publisher: Houghton Mifflin College 0395902258.
Essential References.	
	- Solomn and Fryhle (2003). Organic Chemistry, Wily international brooks/ cale, thombsn learning, 2003, 8th edition.
Electronic Materials and Web Sites etc.	
	Nil

IX. Course Policies: (Based on the Uniform Students' Bylaw (2007))	
1	Class Attendance: Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	Tardiness: A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	Assignments & Projects: Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	Cheating: Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	Forgery and Impersonation: Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

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I. - Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Prof. Ali Alkaf	Office Hours					
Location & Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							

I. Course Identification and General Information:

1	Course Title:	Pharmaceutical Organic chemistry I				
2	Course Code & Number:	02.04.244				
3	Credit hours:	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2		2		3
4	Study level/ semester at which this course is offered:	2 nd Year- 1st Semester				
5	Pre –requisite (if any):	General chemistry				
6	Co –requisite (if any):	None				
7	Program (s) in which the course is offered:	Bachelor of Clinical Pharmacy & Pharm. D.				
8	Language of teaching the course:	English				
9	Study System	Semester based System				
10	Mode of delivery:	Regular-Full Time				
11	Location of teaching the course:	Faculty of Clinical Pharmacy				

III: Course Description:

This course provides students with the fundamental knowledge of aliphatic compounds including the nomenclatures, properties, synthesis, chemical reactions and the pharmaceutical application of these compounds. Some practical differentiation methods are also provided.

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I. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Subtopics List	Number of Weeks	contact hours
1	Introduction to Pharmaceutical Organic Compounds:	a1, a2, b2	Introduction, solubility , type of chemical bonds, -hybridization and their types, chemical bonding in drug–receptor interactions, - type of isomerisms, Types chemical bond cleavage mechanisms, The effect of cleavage of bond in drug stability,	2	4
2	Stereochemistry and Organic reactions	a2-b1, b2, d1	Model structure that used to draw organic molecules.	3	6
3	Alkanes	a1, a2, b1, b2, c1, d1	Nomenclature, preparations, and reaction properties), Pharmaceutical importance of alkane (activity ,stability)	1	2
4	Midterm Exam	a1-a2, b1, b2, ,c1,d1		1	2
5	Alkenes and alkynes	a1-a2, b1, b2, c1, d1	Alkenes and cycloalkenes (nomenclature, preparations, and reaction properties), elimination & addition reaction mechanism Pharmaceutical importance of alkene (Isomers , activity ,stability Alkynes (nomenclature, preparations, and properties), acidity of acetylene, physical and chemical properties of alkyne group in drug structure.	2	4
6	Organic halides	a1-a2, b1, b2, c1,d1	Alkyl halides (nomenclature, preparations, and properties), Nucleophilic substitution reactions mechanism, and reactions of organometallic compounds.	1	2

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			Pharmaceutical importance of alkyl halide in drug synthesis.		
7	Alcohols , Ethers		-Alcohols (nomenclature, preparations, and properties), esterification reaction mechanisms – Ethers (nomenclature, preparations, and properties), physical and chemical properties of drugs contain alcohol functional group(prodrug),	2	4
8	Amines	a1-a2, b1, b2 ,c1,d1, d2	Aliphatic and aromatic amines (nomenclature, preparations, and properties), factors affecting on the acidity of drugs	2	1
9	Final Exam	a1-a2, b1, b2 , c1,d1		2	1
Number of Weeks /and Units Per Semester				16	36

B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Laboratory safety	1	2	C1, C2
2	Test of alcohols	1	2	C1, C2
3	Test of aldehydes	1	2	C1, C2
4	Test of ketones	1	2	C1, C2
5	Test of acids and their derivatives	2	4	C1, C2
6	Test of ammonium salt	2	4	C1, C2
7	Lasagna's test, test for nitrogen	1	2	C1, C2

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8	Midterm Exam	1	2	C1, C2
9	Test for sulfur	1	2	C1, C2
10	Test for halogen in absence of nitrogen and sulfur	1	2	C1, C2
11	Revision	1	2	C1, C2
12	Final Exam	1	2	C1, C2
Number of Weeks /and Units Per Semester		14 week	28	

II. Intended learning outcomes (ILOs) of the course:

- a1. Define basic principles in pharm. org. chem. especially aliphatic organic compounds such as alcohols, carbonyl and others
- a2. Describe the principles of identification of functional groups in organic compounds or chemical mechanisms and their application in the synthesis of simple medicinal agents.
- b1. Design the methods of synthesis and properties of medicinal agents and critical problems that may be encountered in pharmaceutical organic chemistry application
- b2. Explain the mechanisms of reaction and effect of condition on the type of products
- c1. Identify organic compounds from their physical and chemical properties by analysis of functional groups in a compound.
- c2. Choose and select key starting materials in the synthesis of compounds or simple drugs
- d1. Ability to make an organic reaction using scientific procedures
- d2. Use the principle rules to solve problem and questions related to the course

III. Teaching strategies of the course:

- Lectures
- Assignment and reports Small group discussion sessions
- Problem solving methods presentations

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4	Final Exam	16	50	50%	a1, a2. c1
	Total		100	100%	

VIII. Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1. Required Textbook(s) (maximum two).

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XI. Harold Hart, Leslie E. Craine, David J. (January 1999). Organic Chemistry: A Short Course.; 10th edition ISBN. Hart. Publisher: Houghton Mifflin College 0395902258.

2. Essential References.

- SOLOMN and FRYHLE (2003). Organic Chemistry, Wily international brooks/ cale, thombsn learning, 2003, 8th edition.

3. Electronic Materials and Web Sites etc.

Nil

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IV. Course Policies: (Based on the Uniform Students' Bylaw (2007))

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