

Course E-Syllabus

1	Course title	Introduction to Heterocyclic Chemistry
2	Course number	0353432
3	Credit hours	3 theory
	Contact hours (theory, practical)	3 hours/week
4	Prerequisites/corequisites	0303331
5	Program title	B.Sc.
6	Program code	NA
7	Awarding institution	The University of Jordan
8	School	Science
9	Department	Chemistry
10	Level of course	4 th Year
11	Year of study and semester (s)	4 th , First semester
12	Final Qualification	B.Sc.
13	Other department (s) involved in teaching the course	NA
14	Language of Instruction	English
15	Teaching methodology	<input type="checkbox"/> Blended <input checked="" type="checkbox"/> Online
16	Electronic platform(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
17	Date of production/revision	25/10/2020

18 Course Coordinator: Prof. Kamal Sweidan

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19 Other instructors:

Name:
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Name:
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20 Course Description:

Synthesis and reactions of the following classes of heterocycles: saturated heterocycles containing one heteroatom (N, O or S); heteroaromatics: furan, thiophene, pyrrole, pyridine, quinoline and isoquinoline; indole; nomenclature of condensed heteroaromatics; natural occurrence and biological activity of heterocyclic compounds.

21 Course aims and outcomes:

A- Aims:

The student will get familiar with structural and electronic properties and reactions for the most important heterocycles as well as different systems of nomenclature (Trivial and Hantzsch-Widman systems). The course aims at giving a fundamental theoretical understanding and knowledge of heterocyclic chemistry, including alternative general methods for ring synthesis (e.g. cyclization, cycloaddition,..) and application of such methods for the preparation of specific groups of heterocyclic systems.

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to

1. Knowledge and Understanding

1. Identify the structural and electronic features of various heterocyclic compounds.
2. Naming of various heterocyclic compounds.
3. Describe the theoretical understanding of heterocyclic chemistry which includes various methods for ring synthesis and application of those methods for the preparation of specific groups of heterocyclic systems.
4. Discuss mechanisms of various organic reactions.

2. Intellectual skills

1. Apply such knowledge to solve related problems.

3. Practical skills

1. Apply organic reactions in multi-steps synthesis of various heterocycles.

22. Topic Outline and Schedule:

Week	Lecture	Topic	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	Nomenclature of simple heterocyclic compounds	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Cha. 11
	1.2	Nomenclature of simple heterocyclic compounds	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Cha. 11
	1.3	Nomenclature of simple heterocyclic compounds	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Cha. 11
2	2.1	Effect of heteroatom on structure and properties	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th

					Ed., Cha. 1
	2.2	Effect of heteroatom on structure and properties	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Cha. 1
	2.3	Effect of heteroatom on structure and properties	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Cha. 1
3	3.1	General methods for ring synthesis	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	3.2	General methods for ring synthesis	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	3.3	General methods for ring synthesis	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
4	4.1	Three-membered heterocycles: Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom. Unsaturated three-membered heterocycles.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	4.2	Three-membered heterocycles: Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom. Unsaturated three-membered heterocycles.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	4.3	Three-membered heterocycles: Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom. Unsaturated three-membered heterocycles.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
5	5.1	Four-membered	Asynchronous:	Midterm and Final	Hetero.

		<p>heterocycles: Saturated four-membered heterocycles containing one heteroatom. Saturated four -membered heterocycles containing more than one heteroatom. Unsaturated four -membered heterocycles</p>	lecturing/meeting	Exams	Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	5.2	<p>Four-membered heterocycles: Saturated four-membered heterocycles containing one heteroatom. Saturated four -membered heterocycles containing more than one heteroatom. Unsaturated four -membered heterocycles</p>	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	5.3	<p>Four-membered heterocycles: Saturated four-membered heterocycles containing one heteroatom. Saturated four -membered heterocycles containing more than one heteroatom. Unsaturated four -membered heterocycles</p>	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
6	6.1	<p>Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.</p>	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	6.2	<p>Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.</p>	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	6.3	<p>Five-membered heterocycles: Aromatic five-membered heterocycles containing one</p>	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 &

		heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.			27
7	7.1	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	7.2	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	7.3	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
8	8.1	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	8.2	Five-membered heterocycles: Aromatic five-membered heterocycles containing one	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 &

		heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.			27
	8.3	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Midterm and Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
9	9.1	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	9.2	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
	9.3	Five-membered heterocycles: Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	Asynchronous: lecturing/meeting	Final Exams	Hetero. Chem.: Joule and Mills, 4 th Ed., Chas. 3 & 27
10	10.1	Six-membered heterocycles: six-membered aromatic heterocycles containing one	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8

		heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms			
	10.2	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	10.3	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
11	11.1	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	11.2	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	11.3	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
12	12.1	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	12.2	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8

	12.3	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exams	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
13	13.1	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exam	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	13.2	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exam	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
	13.3	Six-membered heterocycles: six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	Asynchronous: lecturing/meeting	Final Exam	Hetero.Chem. Gilchrist, 3 rd Ed., Chas. 6 & 8
14	14.1	Fused heterocyclic rings	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist, 3 rd Ed.,
	14.2	Fused heterocyclic rings	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist, 3 rd Ed.,
	14.3	Fused heterocyclic rings	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist, 3 rd Ed.,
15	15.1	Applications of heterocycles in medicinal Chemistry	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist,

					3 rd Ed.,
	15.2	heterocycles in medicinal Chemistry	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist, 3 rd Ed.,
	15.3	heterocycles in medicinal Chemistry	Asynchronous: lecturing/meeting	Final Exam	Hetero. Chem.: Joule and Mills, 4 th Ed., Hetero.Chem. Gilchrist, 3 rd Ed.,

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz...etc

23 Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
Midterm Exam	50	Topic of week 1 to week 8	8	Moodle
Final Exam	50	All topics are included	16	Moodle

24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

students should have a computer, internet connection, account on a Microsoft teams software/

25 Course Policies:

A- Attendance policies:

Maximum 20% absence is allowed.

B- Absences from exams and handing in assignments on time:

Incomplete Exams are conducted later after arrangement a new date.

C- Health and safety procedures:

This is a theoretical course.

Special Needs Students: Feel free to inform your instructor of your special needs in order to have a productive learning experience.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

The general Jordan University's laws are applied in any case of cheating.

E- Grading policy:

Letters scale is applied.

F- Available university services that support achievement in the course:

Free Internet-access and E-learning.

26 References:

A- Required book(s), assigned reading and audio-visuals:

Heterocyclic Chemistry: Gilchrist, 3rd Ed., 1997.

Heterocyclic Chemistry: Joule and Mills, 4th Ed., 2000

B- Recommended books, materials and media:

<https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/heterocy.htm>

hcopgnt.com/admin/uploads/heterocyclics.pptx

27 Additional information:

Name of Course Coordinator: Dr. Kamal Sweidan Signature: ----- Date: 25-10-2020

Head of Curriculum Committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of Curriculum Committee/Faculty: ----- Signature: -----

Dean: ----- Signature: -----