



Jordan University of Science and Technology
Faculty of Science & Arts
Chemistry Department

CHEM314 Advanced Organic Chemistry Lab - JNQF Level: 6

Second Semester 2023-2024

Course Catalog

1 Credit Hours. The Course Description for Advanced Organic Chemistry Lab, featuring the listed experiments, might encompass the following topics: This laboratory course offers advanced practical experience in organic synthesis and reaction mechanisms, building upon the foundational knowledge gained in introductory organic chemistry courses. The experiments listed below are indicative of the sophisticated reactions and techniques covered in the course: 1. Dibenzalacetone by the Aldol Condensation: Students will explore the aldol condensation reaction, synthesizing dibenzalacetone from the condensation of two molecules of benzaldehyde in the presence of a base catalyst. This experiment emphasizes the formation of carbon-carbon bonds and stereochemical considerations. 2. Diels-Alder Reaction: Synthesis of Tetrahydrophthalic Anhydride: The Diels-Alder reaction, a powerful method for constructing cyclic compounds, will be employed to synthesize tetrahydrophthalic anhydride from a conjugated diene and a dienophile. This experiment highlights both the regioselectivity and stereoselectivity inherent in Diels-Alder reactions. 3. Synthesis of The Sweetener Dulcin from The Analgesic Acetaminophen: Students will engage in a multistep synthesis to transform the analgesic acetaminophen into the sweetener dulcin. This experiment involves various functional group transformations and purification techniques. 4. Dilantin® and Benzilic Acid from Benzaldehyde: Through a series of reactions including condensation, reduction, and rearrangement, students will synthesize Dilantin® (phenytoin) and benzilic acid from benzaldehyde. This experiment showcases the application of diverse synthetic strategies to access complex molecules. 5. Photoreduction of Benzophenone and Rearrangement of Benzopinacol to Benzopinacolone: Students will investigate photochemical reactions by performing the photoreduction of benzophenone to benzopinacol and subsequent rearrangement to benzopinacolone. This experiment underscores the role of light in driving chemical transformations and the mechanistic intricacies of photochemistry. Throughout the course, students will gain proficiency in advanced synthetic techniques, including inert atmosphere reactions, chromatographic separations, and spectroscopic analyses (such as IR, NMR, and UV-Vis spectroscopy) for compound characterization. Emphasis will be placed on critical thinking skills, experimental design, and interpretation of results. Additionally, students will explore the underlying principles governing organic reactions and mechanisms, deepening their understanding of organic chemistry concepts. Safety protocols and good laboratory practices will be strictly enforced to ensure a safe and productive learning environment.

Teaching Method: On Campus

Text Book

Title	Laboratory Manual for General, Organic, And Biological Chemistry
Author(s)	Timberlake KC
Edition	3rd Edition
Short Name	Lab Manual

Other Information	
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Instructor	
Name	Mr. Amer Alshiekh Ali
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Instructor	
Name	Mr. Tareq Harahsheh
Office Location	-
Office Hours	Sun : 11:00 - 12:00 Sun : 12:00 - 13:00 Mon : 11:00 - 12:00 Mon : 12:00 - 13:00 Tue : 11:00 - 12:00 Wed : 10:00 - 11:00
Email	tkharahsheh@just.edu.jo

Class Schedule & Room
<p>Section 1: Lecture Time: Tue : 13:30 - 16:30 Room: LAB6 (D3 L-2)</p> <p>Section 2: Lecture Time: Tue : 13:30 - 16:30 Room: LAB5 (D3 L-2)</p> <p>Section 4: Lecture Time: Wed : 13:30 - 16:30 Room: LAB6 (D3 L-2)</p> <p>Section 5: Lecture Time: Wed : 08:30 - 11:30 Room: LAB5 (D3 L-2)</p>

Prerequisites		
Line Number	Course Name	Prerequisite Type
912141	CHEM214 Organic Chemistry Lab (2)	Prerequisite / Pass
913121	CHEM312 Spectroscopic Identification Of Organic Compounds	Pre./Con.

Tentative List of Topics Covered		
Weeks	Topic	References

Week 1	Check In	
Week 2	Dibenzalacetone by the Aldol Condensation	
Week 3	Diels-Alder Reaction: Synthesis of Tetrahydrophthalic Anhydride	
Week 4	Synthesis of The Sweetener Dulcin from The Analgesic Acetaminophen-Preparation of Phenacetin	
Week 5	Synthesis of The Sweetener Dulcin from The Analgesic Acetaminophen-Preparation of Dulcin from Phenacetin	
Week 6	Dilantin and Benzilic Acid from Benzaldehyde-Benzoin from Benzaldehyde	
Week 7	Dilantin and Benzilic Acid from Benzaldehyde-Benzil from Benzoin	
Week 8	Dilantin and Benzilic Acid from Benzaldehyde- Dilantin from Benzil & Benzilic Acid from Benzil	
Week 9	Photoreduction of Benzophenone and Rearrangement of Benzpinacol to Benzopinacolone - Photoreduction of Benzophenone	
Week 10	Photoreduction of Benzophenone and Rearrangement of Benzpinacol to Benzopinacolone - Synthesis of Beta-Benzopinacolone: The Acid-Catalyzed Rearrangement of Benzpinacol	
Week 11	Synthesis of Anthranilic Acid from Phthalimide via a Hoffmann Rearrangement	
Week 12	Check Out	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
perform organic laboratory procedures with proper safety procedures [1a, 1k] [1L6K2]	30%	
Perform the following techniques as a part of synthetic procedures: aqueous workup, distillation, reflux, separation, isolation, and crystallization. [1b, 1e] [1L6K2, 1L6C1]	20%	
engage in a multistep synthesis and functional group transformation [1a, 1c] [1L6K1]	30%	
learn advanced organic synthetic techniques and spectroscopic characterization of the product [1e, 1k] [1L6K2, 1L6C4]	20%	

Relationship to Program Student Outcomes (Out of 100%)										
a	b	c	d	e	f	g	h	i	j	k
30	10	15		20						25

Relationship to NQF Outcomes (Out of 100%)			
L6K1	L6K2	L6C1	L6C4
30	50	10	10

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