City University of Hong Kong
Course Syllabus

offered by Department of Chemistry
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	Advanced Organic Chemistry
Course Code:	CHEM8131
Course Duration:	1 semester
Credit Units:	4 credits
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	BCH8131 Advanced Organic Chemistry
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to:

- introduce organic chemistry of aldol reactions and enolate anions;
- explain the structures and reactions of carbohydrates and lipids;
- introduce basic strategies of multi-step organic syntheses;
- explain conformational, steric, and stereoelectronic effects of organic molecules;
- critically evaluate organic reaction mechanisms;
- develop knowledge of nucleophilic substitution reaction.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs[#]	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes		
			A1	*A2*	*A3*
1.	Describe the concepts and basic principles of aldol reactions and enolate anions; describe the principles of chemistry in carbohydrates and lipids.		✓	✓	
2.	Apply the strategies and principles in multi-step organic syntheses.		✓	✓	✓
3.	Compare and contrast conformational, steric, and stereoelectronic effects of organic molecules.		✓	✓	
4.	Apply various techniques in studying organic reaction mechanisms.		✓	✓	✓
5.	Explain various factors affecting nucleophilic substitution reactions.		✓	✓	
		100%			

A1: *Attitude*
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: *Ability*
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Learning and Teaching Activities (LTAs)

LTA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lectures and tutorials	Students will learn the concept of enolate, the principles of aldol reaction, and the structures and reactions of carbohydrates and lipids through discovery-based teaching and learning activities in lectures and tutorials.	✓					
Lectures and tutorials	Students will learn basic strategies of multi-step organic syntheses through discovery-based teaching and learning activities in lectures and tutorials.		✓				
Lectures and tutorials	Students will learn the conformational, steric, and stereoelectronic effects of organic molecules through discovery-based teaching and learning activities in lectures and tutorials.			✓			
Lectures and tutorials	Students will learn basic concepts and principles of modern techniques used in studying organic reaction mechanisms through discovery-based teaching and learning activities in lectures and tutorials.				✓		
Lectures and tutorials	Students will learn various factors affecting nucleophilic substitution reactions through discovery-based teaching and learning activities in lectures and tutorials.					✓	

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment: 30%							
Short Quizzes	✓	✓	✓	✓	✓	30%	
Examination: 70% (duration: 3 hours)							
						100%	

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM:
"A minimum of 40% in both coursework and examination components."

5. Assessment Rubrics

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Short Quizzes	Ability to explain chemical reaction/reactivity based on the knowledge of organic chemistry listed in section 3.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Examination	Ability to propose practical solutions/methods to new organic chemical transformation; ability to explain the mechanism of organic chemical reaction.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Short Quizzes	Ability to explain chemical reaction/reactivity based on the knowledge of organic chemistry listed in section 3.	High	Significant	Basic	Not even reaching marginal levels
2. Examination	Ability to propose practical solutions/methods to new organic chemical transformation; ability to explain the mechanism of organic chemical reaction.	High	Significant	Basic	Not even reaching marginal levels

Part III Other Information

1. Keyword Syllabus

- aldol reactions and enolate anions: keto and enol tautomers, crossed aldol reaction, cyclization via aldol condensation, Michael addition, Robinson annulation
- carbohydrates and lipids: mutarotation, monosaccharide, alditol, osazone, disaccharide, polysaccharide, reducing sugar vs non-reducing sugar, fatty acids and triacylglycerols, terpenes and terpenoids, steroids, prostagladins, phospholipids and cell membranes, waxes
- multi-step organic syntheses: protective group, synthetic analysis and planning, retrosynthetic analysis, control of stereochemistry, convergent and linear synthesis
- conformational, steric, and stereoelectronic effects: steric strain, heteroatom, angle strain, conformational analysis, axial vs equatorial
- organic reaction mechanisms: kinetic vs thermodynamic control, substituent effect, isotope effect, solvent effect, catalysis
- nucleophilic substitution reaction: Sn1 vs Sn2 reaction, carbocations, nucleophilicity, leaving group effects, neighboring-group participation, rearrangement

2. Reading List

2.1 Compulsory Readings

1.	
2.	
3.	
…	

2.2 Additional Readings

1.	Organic Chemistry, T.W.G. Solomons (John Wiley and Sons, 7th or 8th edition)
2.	Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg
3.	
…	