

CHEM2007: PRINCIPLES OF ORGANIC CHEMISTRY

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Principles of Organic Chemistry

Subject Code

CHEM - Chemistry

Course Number

2007

Academic Unit

Chemistry (CHEM)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

4

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

BCH2007 Principles of Organic Chemistry

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to provide students with an understanding of the basic principles of organic chemistry, practical laboratory experience in chemical transformation and organic analysis (CHEM2007 student only), and develop an understanding of the spectroscopic identification of the various classes of organic compounds.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify the classes of organic compounds, by drawing and interpreting structural formulas, explaining constitutional isomers, stereoisomers and conformational isomers, and describing the principles of electron delocalization and resonance structure.	20	x	x	x
2	Describe the definition of Lewis acid and base by using resonance and inductive effects to explain and interpret values of K_a and pK_a of acids.	10	x	x	x
3	State and describe the chemistry related to alkanes, alkyl halides, alkenes, alkynes, alcohols, aromatic compounds, amines, carboxylic acids and their derivatives, apply them in analysis and synthesis and draw reaction mechanisms of the more important types of reactions.	45	x	x	x
4	Design and implement basic chemical purification, separation, transformations and qualitative analyses in a laboratory and report findings.	25	x	x	x

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 real-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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and tutorials	Students will engage in lectures and tutorials and learn to explain the structure and bonding of organic compounds. Students will build/draw the chemistry models to see the three-dimensional nature of molecule. Students will practice to use the arrow pushing technique to explain reaction mechanism.	1	
2	Lectures and tutorials	Students will participate in lectures and tutorials and explain the principles of acid and base and electronic effect. Students will engage in the introduction of electron withdrawing and electron donating.	2	
3	Lectures and tutorials	Students will engage in a combination of lectures and tutorials, learn to explain the principles in reaction and synthesis, and see some of the biological, medicinal and environmental applications.	3	
4	Experiments	Students will participate in a series of basic organic chemistry experiments in the laboratory and acquire the hands-on skills (CHEM2007 only).	4	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial assignment	1, 2, 3	40	Continuous Assessment (40%) - Tutorial assignment - Short quizzes - Short quizzes in the laboratory, laboratory report and continuous assignment in the laboratory (CHEM2007 only)

2	Short quizzes	1, 2, 3		
3	Short quizzes in the laboratory, laboratory report and continuous assignment in the laboratory (CHEM2007 only)	4		

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

Additional Information for ATs

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."

Assessment Rubrics (AR)**Assessment Task**

Tutorial assignment

Criterion

Student completes the activity demonstrates grasp of the important concepts to the topic concerned.

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of the principles of organic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of organic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of organic chemistry.

Marginal (D)

Able to briefly describe isolated principles of organic chemistry.

Failure (F)

Fail to accurately describe and explain relevant basic principles of organic chemistry.

Assessment Task

Short quizzes

Criterion

Student completes the activity demonstrates grasp of the important concepts to the topic concerned.

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of the principles and practice of organic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of organic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of organic chemistry.

Marginal (D)

Able to briefly describe isolated principles of organic chemistry.

Failure (F)

Fail to accurately describe and explain relevant principles of organic chemistry.

Assessment Task

Short quizzes in the laboratory, laboratory report and continuous assignment in the laboratory (CHEM2007 only)

Criterion

Student completes the assessment tasks/activities and demonstrates writing and presentation skills.

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of the principles and laboratory practice of organic chemistry and spectroscopic analysis.

Good (B+, B, B-)

Able to describe and explain the principles and laboratory practices of organic chemistry and spectroscopic analysis.

Fair (C+, C, C-)

Able to describe and explain some key principles and laboratory practices of organic chemistry and spectroscopic analysis.

Marginal (D)

Able to briefly describe isolated principles of and laboratory practices of organic chemistry and spectroscopic analysis.

Failure (F)

Fail to accurately describe and explain relevant principles of and laboratory practices of organic chemistry and spectroscopic analysis.

Assessment Task

Examination

Criterion

Student demonstrates grasp of the important concepts to the topic concerned, and can apply these concepts to solve problems. Strong evidence of demonstrated use of concepts for rationalization, with some originality in thought and argument.

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of the principles of organic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of organic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of organic chemistry.

Marginal (D)

Able to briefly describe isolated principles of organic chemistry.

Failure (F)

Fail to accurately describe and explain relevant principles of organic chemistry.

Part III Other Information

Keyword Syllabus

Carbon compounds: structural and bonding theories, isomers and functional groups

Acids and bases, electronic effect

Alkanes and cycloalkanes: nomenclature, conformational Analysis

Stereochemistry: chiral molecules, stereoisomers

Infrared spectroscopy and UV-vis spectroscopy: structure determination*

Alkyl halides: nucleophilic substitution, reactions of radical

Alkenes and alkynes: elimination and addition reactions*

Alcohols and ethers: oxidation-reduction*

Aromatic compounds: aromaticity, resonance, aromatic substitution*

Carboxylic acid and its derivatives: nucleophilic addition-elimination at the acyl carbon*

Amines*

*Topics are covered only in CHEM2007 and CHEM2007A

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Organic Chemistry / T.W. Graham Solomons, Craig B. Fryhle
2	Introduction To Spectroscopy : A Guide For Students Of Organic Chemistry / Donald L. Pavia, Gary M. Lampman, George S. Kriz, Jr.