

# CHEM2007: PRINCIPLES OF ORGANIC CHEMISTRY

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## Effective Term

Semester A 2022/23

## 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.

**Teaching and Learning Activities (TLAs)**

	<b>TLAs</b>	<b>Brief Description</b>	<b>CILO No.</b>	<b>Hours/week (if applicable)</b>
1	Lectures and tutorials	Teaching and learning will be based on a combination of lectures and tutorials to explain the structure and bonding of organic compounds. Chemistry models will be used to show the three-dimensional nature of molecule. Arrow pushing technique will be introduced.	1	
2	Lectures and tutorials	Teaching and learning based on a combination of lectures and tutorials to explain the principles of acid and base and electronic effect. Electron withdrawing and electron donating group will be introduced.	2	
3	Lectures and tutorials	Teaching and learning will be based on a combination of lectures and tutorials to explain the principles in reaction and synthesis. Biological, medicinal and environmental applications will be discussed.	3	
4	Experiments	Teaching and learning will be primarily by a series of ten experiments some of which are designed by students to be carried out in the laboratory (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-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Short quizzes

**Criterion**

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

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**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-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**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-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

**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.