CHEM2006: PRINCIPLES OF INORGANIC CHEMISTRY

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Principles of Inorganic Chemistry

Subject Code
CHEM - Chemistry
Course Number
2006

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
BCH2006 Principles of Inorganic Chemistry

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to allow students to develop an understanding of the basic principles and modern concepts of inorganic chemistry from a discovery approach with an emphasis on atomic structures and properties, chemical bonding and coordination chemistry; Students undertaking BCH2006 will also acquire practical experience on inorganic chemistry experiments.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Relate the atomic structures of elements with their physical and chemical properties.	15	x		
2	Apply Lewis structures, Valence-Shell Electron-Pair Repulsion Theory, Valence Bond Theory and Molecular Orbital Theory to explain the physical and chemical properties of molecules, leading to the design and discovery of new molecules.	20	x	x	
3	Describe and explain the chemistry of Groups 17 and 18 elements.	10	x	x	
4	Describe possible isomerism of a metal complex and explore the role of the electronic configuration of a metal complex on its coordination number, geometry and reactivity.	15	x		
5	Predict and explain the colour, stability, geometry and magnetic properties of a metal complex using Valence Bond Theory and Crystal Field Theory.	15	x	x	
6	Explain the properties of solvents, acids and bases.	15	x		
7	Apply principles and synthetic techniques to conduct inorganic chemistry experiments from a discovery approach.	10		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)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and tutorials	Students will develop an understanding on atomic structures and correlation with the physical and chemical properties in lectures and tutorials from a discovery approach.	1	0.5
2	Lectures and tutorials	In lectures and tutorials, students will apply various theories to explore, predict and explain the structures, bonding and properties of simple molecules, leading to the design and discovery of new molecules.	2	1
3	Lectures and tutorials	In lectures and tutorials, students will develop an understanding on the chemistry of Groups 17 and 18 elements	3	0.5
4	Lectures and tutorials	Students will develop an understanding of isomerism of a metal complex and correlate properties of a metal complex with its electronic configuration in lectures and tutorials.	4	0.5
5	Lectures and tutorials	In lectures and tutorials, students will apply Valence Bond Theory and Crystal Field Theory to explain various properties of a metal complex from a discovery approach.	5	0.5
6	Lectures and tutorials	Students will develop an understanding of solvents, acids and bases and predict their properties in lectures and tutorials.	6	0.5

7	Experiments and written reports	Students, in the form of small groups, will conduct inorganic chemistry experiments from a discovery approach, and present their results in written reports. (CHEM2006 only)	7	2

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial Questions and Assignments	1, 2, 3, 4, 5, 6	10	
2	Tests	1, 2, 3, 4, 5, 6	10	
3	Lab Reports	7	10	

Continuous Assessment (%)

30

Examination (%)

70

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 questions and assignments

Criterion

ABILITY to develop an understanding on basic concepts of inorganic chemistry

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

Assessment Task
Tests

Criterion
ABILITY to describe and explain basic concepts of inorganic chemistry to solve problems

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

Assessment Task
Lab reports(CHEM2006 only)

Criterion
ABILITY to conduct inorganic chemistry experiments and present results in written reports

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

Assessment Task
Examination

Criterion
ABILITY to describe, explain, and integrate basic concepts of inorganic chemistry and apply them to solve problems

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

Atomic Structure
The quantisation of energy. Bohr’ s theory of the hydrogen atom. Quantum theory and atomic orbitals. Many-electron atoms.

Atomic Properties
Atomic radii. Ionisation energies. Electron affinities. Electronegativity. Periodic trends.

Chemical Bonding
Lewis structures. Resonance. VSEPR method and molecular geometry. Hybrid orbitals. Molecular orbitals. Bonding in solids.

Main Group Chemistry
Group 17 chemistry: hydrogen halides, interhalogen compounds, and oxidation state. Group 18 chemistry: VSEPR.

Coordination Chemistry
Coordination numbers and coordination geometries. Types of ligands. Bonding. Reactivity of coordination compounds.

Solvents, Solutions, Acids and Bases
Solvent properties. Definitions of acids and bases. Hard and soft acid base concepts.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Inorganic Chemistry 6th Edition, Duward Shriver, Mark Weller, Tina Overton, Fraser Armstrong, Jonathan Rourke, Publisher: W. H. Freeman, 2014.
2	Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, P. L. Gaus, 2nd Edition, Wiley, New York, 1995.