

CHEM2006: PRINCIPLES OF INORGANIC CHEMISTRY

Effective Term

Semester A 2025/26

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 CHEM2006 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; explain the properties of solvents, acids and bases.	30	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 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.	25	x		
4 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	
5 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.

Learning and Teaching Activities (LTAs)

LTAs	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.	3	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.	4	0.5
6	Lectures and tutorials	Students will develop an understanding of solvents, acids and bases and predict their properties in lectures and tutorials.	1	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)	5	2

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Tutorial Questions and Assignments	1, 2, 3, 4	10	-	Yes

2	Tests	1, 2, 3, 4	10	The tests are in a closed-book format.	No
3	Lab Reports	5	10	-	Yes

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

3

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

40

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-)

Able to demonstrate excellent understanding of basic concepts of inorganic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of various topics of inorganic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of selected topics of inorganic chemistry.

Marginal (D)

Able to briefly describe isolated principles of selected topics of inorganic chemistry.

Failure (F)

Fail to accurately describe and explain relevant principles of any topics of inorganic chemistry.

Assessment Task

Tests

Criterion

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

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of basic concepts of inorganic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of various topics of inorganic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of selected topics of inorganic chemistry.

Marginal (D)

Able to briefly describe isolated principles of selected topics of inorganic chemistry.

Failure (F)

Fail to accurately describe and explain relevant principles of any topics of inorganic chemistry.

Assessment Task

Lab reports

Criterion

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

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of basic concepts of inorganic chemistry and organize the knowledge in a clear, logical and accurate manner.

Good (B+, B, B-)

Able to describe and explain the principles of various topics of inorganic chemistry and organize the knowledge in a clear, logical and accurate manner.

Fair (C+, C, C-)

Able to describe and explain some key principles of selected topics of inorganic chemistry and organize the knowledge in a clear, logical and accurate manner.

Marginal (D)

Able to briefly describe isolated principles of selected topics of inorganic chemistry and organize the knowledge in a written form.

Failure (F)

Fail to accurately describe and explain relevant principles of any topics of inorganic chemistry and organize it in a written form.

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-)

Able to demonstrate excellent understanding of basic concepts of inorganic chemistry.

Good (B+, B, B-)

Able to describe and explain the principles of various topics of inorganic chemistry.

Fair (C+, C, C-)

Able to describe and explain some key principles of selected topics of inorganic chemistry.

Marginal (D)

Able to briefly describe isolated principles of selected topics of inorganic chemistry.

Failure (F)

Fail to accurately describe and explain relevant principles of any topics of inorganic chemistry.

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.