



University of Kerala

Discipline	CHEMISTRY				
Course Code	UK1DSCCHE104				
Course Title	GENERAL INORGANIC CHEMISTRY				
Type of Course	DSC				
Semester	1				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	1. Higher secondary level science knowledge				
Course Summary	The course covers atomic structure, chemical bonding, co-ordination chemistry and secondary bond forces, analytical principles including volumetric analysis and Nuclear Chemistry. Students learn about quantum numbers, orbital concepts, electron configuration, bond energetics, molecular geometry, and fundamentals of analytical chemistry. They also gain a detailed understanding of the radioactivity and nuclear chemistry				

Detailed Syllabus:

Module	Unit	Content	Hrs
		GENERAL INORGANIC CHEMISTRY	75
1	Atomic Structure, Chemical bonding and Secondary bond forces		21
	1	Atomic spectrum of hydrogen - different series, Rydberg equation. Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation	3
	2	Schrodinger wave equation (mention only, no derivation), concept of orbitals. Quantum numbers and their significances	2
	3	Orbital wise electron configuration, energy sequence rule – Pauli’s principle, Hund’s rule, Stability of filled and half-filled orbitals.	3
	4	Electronic configuration of lanthanides and actinides, Lanthanide contraction	1
	5	Energetics of ionic bond formation – Born-Haber cycle. Fajan’s rule.	3
	6	Hybridisation and shape of molecules with examples – sp (BeCl ₂), sp ² (BF ₃), sp ³ (CH ₄), sp ³ d(PCI ₅), sp ³ d ² (SF ₆) and sp ³ d ³ (IF ₇)	3
	7	VSEPR theory, regular and irregular geometry, H ₂ O, NH ₃ , XeF ₂ , XeF ₄ . Hydrogen bond – inter and intra molecular – its consequences on boiling point and volatility. Importance of hydrogen bonding in biomolecules – Proteins and nucleic acids.	3
	8	Ionic character of covalent bond – Polar and non-polar covalent compounds.	1
	9	Secondary bond forces in molecules – Ion-dipole, dipole-dipole, ion-induced dipole, dipole-induced dipole and induced dipole-induced dipole	2

		interactions.	
II	Co-ordination chemistry		6
	10	Types of ligands, Werner's coordination theory, Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory.	3
	12	Crystal field theory of octahedral and tetrahedral complexes, examples – high and low spin complexes, magnetic properties, Application in qualitative and quantitative analysis	3
III	Analytical Principles		9
	12	Principles of volumetric analysis – primary standard – standard solutions normality and molarity	3
	13	Theory of acid-base titrations, permanganometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators	3
	14	Principles of colorimetry – estimation of biomolecules - glucose and chlorophyll.	3
IV	Radioactivity and Nuclear Chemistry		9
	15	Radioactive decay series, Radioactive equilibrium, Average life, Half-life. Detection of radio activity-Geiger Muller Counter, Wilson cloud chamber. Units of radioactivity-Curie and Rutherford, Units of radiations.	3
	16	Nuclear Chemistry-stability of nucleus, n/p ratio. Artificial transmutation and radioactivity, mass defect, binding energy.	3
	17	Applications of radio activity- in medicine and agriculture. Biological effects of radiation, pathological and genetic damage.	3
V	VOLUMETRIC ANALYSIS		30
	18	Section A: Volumetric Analysis (8 Experiments from Section A are compulsory) 13. Preparation of standard solutions. 14. Neutralization Titrations m. Strong acid – Strong base n. Strong acid – weak base o. Weak acid – strong base. 15. Redox Titrations - Permanganometry i. Estimation of oxalic acid. j. Estimation of $\text{Fe}^{2+}/\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ /Mohr's salt.	15
	19	Section B (Open ended: Any 3 experiments are to be conducted - May be selected from the list or the teacher can add related experiments) 1. Dichrometry 2. Iodometry & Iodimetry 3. Complexometry 4. Colorimetry	15

References

1. *Bosolo and Johns*, Co-ordination Chemistry.
2. *Rochoco*, Chemistry of Organometallics.
3. *J.D. Lee*, Concise Inorganic Chemistry.

4. Puri, Sharma and Kalia “*Inorganic Chemistry*”
5. A.D. Madan, *Modern Inorganic Chemistry*
6. A.I. Vogel, *A text book of Quantitative analysis*”
7. Day & Underwood, *Quantitative analysis: laboratory manual*”:

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss the rules for filling electrons in atomic orbitals	U	PSO-1
CO-2	Discuss theories of chemical bonding and their limitations	U	PSO-1
CO3	Predict geometry of molecules from the type of hybridisation.	Ap	PSO-1,2,3
CO 4	Discuss the important theories of coordination compounds	U	PSO-1
CO 5	Critically select suitable indicators for acid base and redox titrations	E	PSO-1,2,3
CO 6	Apply the basic principles in quantitative analysis	Ap	PSO-1,2,3,4,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: GENERAL INORGANIC CHEMISTRY

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PO-1,6 PSO-1	U	F, C	L	-
2	CO-2	PO-1,6 PSO-1	U	F, C	L	-
3	CO3	PO-1,6 PSO-1,2,3	Ap	F, C, P	L	-
4	CO 4	PO-1,6 PSO-1	U	F, C	L	-
5	CO 5	PO-1,6	E	F, C, P	L	-

		PSO-1,2,3				
6	CO 6	PO-1,2,6 PSO-1,2,3,4,5	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	-	-	-	-	2	-	-	-	-	2	-	-
CO 2	3	-	-	-	-	2	-	-	-	-	2	-	-
CO 3	3	2	2	-	-	2	-	-	-	-	2	-	-
CO 4	3	-	-	-	-	2	-	-	-	-	2	-	-
CO 5	2	2	2	-	-	2	-	-	-	-	2	-	-
CO 6	2	2	2	2	3	2	2	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓			✓
CO 6	✓			✓