

SEMESTER VIII

KU8DSCCHE401: INORGANIC CHEMISTRY -V

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	Major	400	KU8DSCCHE401	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description: This major paper describes the concepts of structural inorganic chemistry, bio inorganic chemistry, organometallic chemistry and reaction mechanism in coordination compounds.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the structure, properties of Boron, Phosphorous, Sulfur and Nitrogen compounds	U
2	Understand the different inorganic compounds in biological system	U
3	App the principles of transition metal coordination complexes in understanding reactivity and properties of organometallic compounds	A
4	Understanding the interaction of metal ions and ligands facilitating the design and synthesis of coordination compounds with specific properties and applications	U/A

***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
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CO 1	✓	✓					
CO 2	✓				✓		
CO 3	✓			✓			
CO 4	✓						

Course Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	HOURS
1		STRUCTURAL INORGANIC CHEMISTRY	16
	1	The neutral boron hydrides – structure and bonding topological approach to boron hydride structure – styx number – synthesis and reactivity of neutral boron hydrides. Importance of icosahedral frame work of boron atoms in boron chemistry – Closo, nido and arachno structure – Wades rule – mno rule – carboranes and metallocarboranes.	
	2	Phosphorous sulphides – P_4S_3 , P_4S_5 , P_4S_7 and P_4S_{10} – preparation, properties, structure and uses. The phosphazenes (phosphonitrilic halides).	
	3	Sulphur nitrogen compounds – S_2N_2 and S_4N_4 – Polythiazl other S_xN_y compounds. Their preparation properties, structure	
2		BIO INORGANIC CHEMISTRY	16

	1	The organization of cell – physical structure of cells, the inorganic composition of cells. Role of metal ions in the biological system. Essential and non-essential elements.	
	2	Transport, transfer and transcription – sodium and potassium transport, calcium signalling proteins, zinc in transcription, selective transport and storage of iron, oxygen transport and storage, electron transfer.	
	3	Biological cycles – nitrogen cycle, hydrogen cycle Sensors – iron proteins as sensors, proteins that sense copper and zinc levels. Biomineralization	
	4	Chemistry of elements in medicine – Chelation therapy, cancer treatment, anti-arthritis drugs, imaging agents	

3	SPECTRAL AND MAGNETIC PROPERTIES OF COORDINATION COMPOUNDS -II		8
	1	Reaction of complexes: Ligand substitution reactions (Square planar and octahedral complexes). Rates of ligand substitutions, classification of mechanisms.	
	2	Nucleophilicity of the entering group, The shape of the transition states, The activation of octahedral complexes, Base hydrolysis, stereochemistry, Isomerisation reactions	

4.	SPECTRAL AND MAGNETIC PROPERTIES OF COORDINATION COMPOUNDS -III		8
	1	Brief study of redox reaction and photochemical reactions. Reaction of metal complexes: Stability constants – chelate effect – Irving-Willian order of stability. Factors affecting the stability of metal complexes.	

	2	Determination of binary formation constants by pH meter and spectrophotometry- energy profile of a reaction.	
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5	TEACHER SPECIFIC MODULE - ORGANOMETALLIC CHEMISTRY		12
	1.	Introduction: General methods of preparations – General properties – organometallic compounds of alkali metals, organometallic compounds of beryllium – organometallic compounds of Mg, Al. Metal-olefin (alkene) complexes.	
	2.	d- block carbonyls: Metallocenes, metal-metal bonding and metal clusters. Reactions – oxidative addition and reductive elimination. σ -bond meta thesis. 1 + 1 migratory insertion reactions. Catalysis by organometallic compounds (eg: alkene hydrogenation, hydroformylation, Monsanto acetic acid process)	

Essential Readings:

1. F A Cotton, Wilkinson, C A Murillo and M Bochmann "Advanced Inorganic Chemistry 6th edition, Wiley Publications
2. J E Huheey, Inorganic Chemistry Principles of Structure and Reactivity, Pearson Education India
3. S K Agarwal and Keemti Lal, Advanced Inorganic Chemistry, Pragati Prakashan 9th Edition 2009
4. S J Lippard and J M Berg, Principles of bioinorganic chemistry, University Books California
5. David E Fenton, Bio coordination chemistry, Oxford University Press
6. I Bertini, H B Grey, S J Lippard and J S Valentine, Bio inorganic chemistry, University Science Books 1994
7. Indrajith Kumar, Organomettallic compounds, Pragati Prakashan Meerut

8. R C Melhtra and A Singh, Organomettalic Chemistry, New age international
9. R Gopalan and V N Ramalingam, Concise Coordination Chemistry, Vikas publishing house Pvt Ltd
10. M C Day and J Selbin, Theoretical Inorganic Chemistry, Affiliated EAST West Pre

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		70
Continuous Evaluation		30
a)	Test Paper	12
b)	Assignment	6
c)	Seminar/Viva	12
Total		100

*Average mark of the best two written tests may be considered for internal mark.