INORGANIC CHEMISTRY-I

Semester	Subject Code	Category	Lect hou	ture urs	The hou	eory urs	Prac Ho	tical urs	Credits
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
V	21CCH5A	Core-V	4	60	4	60	-	-	4

COURSE OBJECTIVES:

The students will be able to

• Gain knowledge about coordination chemistry, solid state chemistry, metallurgy, transition and inner transition elements.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO	CO Statement	Knowledge
Number		Level
		(K1-K4)
CO1	Learn the basic concepts of coordination compounds, types of ligands,	K4
	isomerism and spectrochemical series, low spin and high spin	
	complexes.	
CO2	Understand the basic concept of Werner's Theory, valence Bond	K4
	Theory, Crystal Field Theory and applications of coordination	
	compounds.	
CO3	Knowledge about crystal structures, crystal defects, applications of	K3
	XRD, electrical and magnetic properties of solids	
CO4	Explain the various metallurgical processes and the chemistry of	K4
	transition elements.	
CO5	Gain knowledge about the chemistry of inner-transition elements, and	K3
	comparative study of lanthanides and actinides.	

*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	S
CO2	S	S	S	S	S	М
CO3	S	S	S	М	S	S
CO4	S	S	М	S	S	S
CO5	S	S	S	S	S	М

(S - Strong; M - Medium; L - Low)

UNIT – I: Coordination Chemistry-I

- Introduction Central metal ion, Complex ion, Coordination number Coordination 1.1 sphere - Classification of ligands - IUPAC Nomenclature of coordination compounds -Bridged/Polynuclear complexes - Isomerism in complexes - Ionisation isomerism, Hydrate isomerism, Linkage isomerism, Ligand isomerism, Coordination isomerism, Polymerisation isomerism – Geometrical and optical isomerism in 4- and 6- coordinated complexes.
- Theories of coordination compounds Werner's coordination theory Sidgwick theory 1.2 - Effective atomic number - Theory of bonding - Valence bond theory - Postulates of VBT - Hybridization - Geometry and magnetic properties - Diamagnetic and paramagnetic complexes – Low spin and high spin complexes – Inner and outer orbital complexes - Limitations of VBT - colour of transition metal complexes - Chelation -Effect of chelation.

UNIT-II: Coordination Chemistry-II

- 2.1 Crystal field theory - Principle - Splitting of d-orbitals in octahedral, tetrahedral and square planar complexes - Spectrochemical series - Crystal field stabilisation energy -Calculation of CFSE in octahedral and tetrahedral complexes - Calculation of CFSE in weak field and strong field ligands.
- 2.2 Low spin and high spin complexes - Explanation of magnetic properties, colour and geometry using CFT – Comparison of VBT and CFT – Application of coordination compounds in analytical, medicinal and agriculture fields.

UNIT-III: Solid State Chemistry

- 3.1 The nature of the solid state – Amorphous and crystalline – Differences – Close packing in crystals – Examples for cubic, bcc and fcc lattices – Bragg's law – Application of XRD to crystal studies – Miller indices, unit cell, space lattice and crystal systems.
- 3.2 Structure of NaCl, CsCl, CaF₂ and ZnS – Band theory of solids, metals, semiconductors and insulators - Defects in solids - Scottky defect and Frenkel defect - Metal excess and metal deficiency defects – Conductors in ionic solids – Electrical and magnetic properties.

12 Hours

12 Hours

12 Hours

Preparation and uses of ammonium molybdate and vanadiumpentoxide.

UNIT-IV: Metallurgy and Transition elements

UNIT-V: Inner-Transition Elements

5.1 General characteristics of f- block elements – Position of lanthanides in the periodic table
– Separation of lanthanides (ion exchange method) – Occurrence, oxidation states, magnetic properties, colour and spectra.

Comparative study of titanium, vanadium, chromium, manganese and iron group

elements with special reference to occurrence, oxidation states, magnetic properties and

colour - Occurrence and extraction of titanium, molybdenum, tungsten and cobalt -

5.2 Lanthanide contraction – Causes and consequences of Lanthanide contraction –
Actinides – Position of actinides in the periodic table – Actinide contraction –
Comparison between lanthanides and actinides – Extraction of Thorium and Uranium.

S.	Authors	Title	Publishers	Year of
No.				publication
1.	B. R. Puri, L. R.	Principles of Inorganic	Milestone	2013
	Sharma and K. C.	Chemistry	Publications	
	Kalia			
2.	R. Gopalan	Text Book of Inorganic	Universities Press	2012
		Chemistry	(India) Private	
			Limited	
3.	R. D. Madan	Modern Inorganic Chemistry	S. Chand and	2008
			Company Ltd.,	
4.	P. L. Soni	Inorganic Chemistry	S. Chand	2006
5.	F. A. Cotton and G.	Advanced Inorganic Chemistry	John Wiley and	1988
	Wilkinson		Sons	

TEXT BOOKS:

4.2

- Zone refining, Van Arkel method and Electrolytic refining.

12 Hours

REFERENCE BOOKS:

S.	Authors	Title	Publishers	Year of
No.				publication
1.	W. U. Malik,	Selected Topics in Inorganic	S.Chand Publications	2008
	G. D. Tuli and	Chemistry		
	R. D. Madan			
2.	J. D. Lee	Concise Inorganic Chemistry	New Delhi, Oxford	2008
			University Press	
3.	Gurdeep Raj	Advanced Inorganic Chemistry	Goel Publishing	1994
			House	
4.	B. K. Sharma	Industrial Chemistry	Goel Publications	1983
5.	S. Prakash	Advanced Chemistry of Rare	S. Chand and	1982
		Elements	Company Ltd.	
6.	S. F. A. Kettle	Coordination Chemistry	Published by Nelson	1979
			and ELBS	
7.	K. Burger	Coordination Chemistry	Butterworthy and	1973
	-		Company Publishers	
			Ltd.	

TEACHING METHODOLOGY:

- Chalk and board teaching
- Power point presentation
- Group discussion
- Seminars
- Assignments

SYLLABUS DESIGNER:

• Dr. N. Dhanam, Assistant Professor of Chemistry.