M.Sc. (Part-I) (Chemistry) CBCS Pattern Semester-II

PSCCHT05 - Paper-I: Inorganic Chemistry

P. Pages: 2 GUG/W/23/11228 Time: Three Hours Max. Marks: 80 Notes: 1. All questions are compulsory. All questions carry equal marks. 2. 1. Explain the electronic spectra of d³ and d⁷ metal ions in weak octahedral field with 8 a) suitable example using Orgel diagram. 8 b) Explain the charge transfer spectra in $KMnO_4$. i) Explain abnormal magnetic properties of octahedral complexes with suitable example. ii) OR Write a note on high spin low spin crossover. c) 4 d) Explain Tunabe-Sugano diagram in octahedral complexes with d² configuration. 4 How do the Racah parameters of a complex ion differ from that of the corresponding free 4 e) ion? Explain how the magnetic and spectral data can be used for determination of structure of f) 4 Tetra halo-Cobalt (II) complexes? 2. What is trans effect? Discuss the different types of theories in trans effect? 8 a) Discuss the mechanism of substitution reaction Pt(II) square pianer complexes? 8 b) OR Explain-4 c) Tunneling effect ii) Cross reaction d) Discuss the electron transfer by inner sphere mechanism. 4 Discuss electrostatic polarization theory with example? e) Explain complementary and non-complementary electron transfer reaction. f) How is vibrational spectroscopy used in explaining structure and bonding in metal 8 **3.** a) carbonyls? Explain with example. i) Classify the metal carbonyl cluster with suitable examples. Discuss non-bridge b) 8 structure of $Co_2(CO)_{o}$. Give any four methods of preparation mononuclear metal carbonyls. ii)

	c)	What do you mean by synergic bonding in metal carbonyl? Explain?	4
	d)	What is EAN rule? Calculate EAN of metal in following- i) $Os_4(CO)_{16}$ ii) $Ni(CO)_4$ iii) $Fe_3(CO)_{12}$	4
	e)	Discuss the experimental evidences in support of the $d\pi-p\pi$ back bonding in metal carbonyl.	4
	f)	How is vibrational spectroscopy used in explaining the strength of back π bonding in following. i) $\text{Cr}(\text{CO})_6$ ii) $\text{V}(\text{CO})_6$	4
4.	a)	Discuss the structure and bonding in metal dinitrogen complexes?	8
	b)	Illustrate with appropriate example the difference between terminal and bridge bonding in nitrosyl complexes with the help of physical parameters including vibrational spectra.	8
		OR	
	c)	Discuss the bonding in metal complexes.	4
	d)	Discuss the various reactions that occur in metal nitrosyl (any four).	4
	e)	Write a note on Vaska's complex.	4
	f)	Discuss the chemistry of brown ring test with special reference to the bonding aspect of nitrosyl species?	4
5.	a)	What is Laporte's orbital selection rule?	2
	b)	Which of the following configurations are aspected to show orbital contribution in high spin octahedral field- d^1 , d^3 , d^6 and d^8 .	2
	c)	Explain bridge activated mechanism.	2
	d)	Give any two-synthetic application of trans effect.	2
	e)	Draw the structure of $\operatorname{Ir}_4(\operatorname{CO})_{12}$.	2
	f)	Draw the structure of $\operatorname{Fe}_3(\operatorname{CO})_{12}$.	2
	g)	Write a note on dioxygen complexes?	2
	h)	Explain the X-ray diffraction method used metal nitrosyl complexes.	2
