M.Sc.- I (Chemistry) (CBCS Pattern) Sem-II

PSCCHT05 - Inorganic Chemistry

P. Pages : 2 **GUG/W/22/11228**

Time : Three Hours * 1 9 6 2 * Max. Marks : 80

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1. a) Explain Tanabe-Sugano diagrams of octahedral complexes with d^2 & d^8 configuration. **8**

b) Draw & Explain orgel diagram for $[CoF6]^{3-}$ complex. **8**

OR

c) Explain the term high spin and low spin crossover with suitable examples. **4**

d) Write a note on **4**
i) Hole formalism ii) Hund's rule.

e) Explain orgel diagram for tetrahedral complex with d^6-configuration. **4**

f) Explain Racah parameter. **4**

2. a) Explain **8**
i) Marcus-Hush theory ii) Bridged activated mechanism.

b) What are the types of electron transfer mechanism? Explain outer sphere mechanism. **8**

OR

c) Describe inner sphere mechanism. **4**

d) Explain the substitution reaction in Pt(II) square planar complexes. **4**

e) Discuss the solvent effect, effect of leaving group in nucleophilic substitution reaction in square planar complexes. **4**

f) Explain complimentary and non complementary reactions. **4**

3. a) What are metal carbonyls? How they classified? Explain structure and bonding in $\left[Fe_2(CO)_9\right]$ and $\left[Fe_3(CO)_{12}\right]$. **8**

b) i) How will you differentiate between terminal and bridging carbonyl groups on the basis of IR spectra of metal carbonyls. **8**

ii) Calculate EAN of metal and state whether EAN is obeyed or not in the following
i) $Ni(CO)_4$ ii) $V(CO)_6$
iii) $Mn_2(CO)_{12}$ iv) $CO_2(CO)_8$

OR

c) Justify the statement $M \rightarrow CO\ \pi$ bond is called as back bonding. **4**

d) Draw the structure of following polynuclear metal carbonyls. **4**

i) $Ir_4(CO)_{12}$ ii) $Os_4(CO)_{16}$

e) How vibrational spectroscopy used in explaining structure and bonding in metal carbonyls? Explain with suitable examples. **4**

f) Give an account of four important chemical reactions of metal carbonyls. **4**

4. a) Write a note on. **8**

i) Wikinson's catalyst ii) Vaska's compound.

b) Discuss the structure and bonding in nitrosyl complex. **8**

OR

c) Write a note on brown ring test. **4**

d) Give important reactions of metal nitrosyls. **4**

e) Write a short note on Dinitrogen and dioxygen complexes. **4**

f) Explain with example the difference between terminal and bridge bonding in nitrosyl complex with the help of physical parameter including IR spectra. **4**

5. a) What are the term symbol for d^2 configuration. **2**

b) What is spin-orbit coupling? **2**

c) What is trans effect? **2**

d) Explain cross reaction with example. **2**

e) Draw the structure of $Rh_6(CO)_{12}$ **2**

f) How many terminal co groups & bridging groups are present in $CO_4(CO)_{12}$. **2**

g) Give the IUPAC name of $\left[RhCl(pph_3)_4\right]$ and $\left[IrCl(CO)(pph_3)_2\right]$ **2**

h) Explain the effect of back bonding and bond order on vibrational frequency of co molecule in metal carbonyl. **2**

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