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

PSCCHT05 - Inorganic Chemistry

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Time : Three Hours Max. Marks : 80

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1. a) Explain the electronic spectra of d^3 and d^7 metal ion in weak octahedral field with suitable example using orgel diagram. **8**

b) i) Explain magnetic moment electronic spectra and structure of tetrahalocobalt (II) complexes. **8**

ii) Define charge transfer spectra with suitable example.

OR

c) Explain abnormal magnetic properties in octahedral complex. **4**

d) Write a short note on the following. **4**
i) Laporte selection rule ii) Spin Selection rule

e) Explain the following terms: **4**
i) Spin-orbit (L-S) coupling scheme for energy term
ii) Recah parameter.

f) Derive ground state term symbol for the following transition metal in complexes. **4**
i) $[Fe(H_2O)_6]^{2+}$ ii) $[Cr(H_2O)_6]^{3+}$

2. a) What are trans effect? Discuss theories of trans effect with suitable example. **8**

b) Discuss various factor affecting the rate of substitution reaction in square planer complexes. **8**

OR

c) What is electron transfer reaction? Discuss inner sphere mechanism with suitable example. **4**

d) Discuss the mechanism of substitution reaction in Pt (II) square planer complex. **4**

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

f) Explain complementary anal non-complementary reaction with suitable example.. **4**

3. a) i) What are mental carbonyl? Discuss its classification with suitable example. **8**

ii) Give an account of four important reaction of metal carbonyls.

b) Explain structure and bonding in $Mn_2(CO)_{10}$ and $Fe_2(CO)_9$. **8**

OR

c) Explain vibrational spectra of metal carbonyl. **4**

d) Calculate EAN of the metal in following metal carbonyl. **4**

i) $Fe_3(CO)_{12}$ ii) $Ru_2(CO)_9$

iii) $Co_4(CO)_{12}$ iv) $Os_2(CO)_9$

e) Explain π(Pi) - back bonding in metal carbonyl. **4**

f) What are metal carbonyl cluster? Give their classification with suitable example. **4**

4. a) i) Write preparation structure and bonding in transition metal nitrosyl complex. **8**

ii) Discuss the various reaction that occur in metal nitrosyl complex (any four).

b) Explain different type of bonding by nitrosyl in metal nitrosyl complex with Example. **8**

OR

c) Explain Wilkinson's catalyst. **4**

d) Write a note on dinitrogen complex. **4**

e) Calculate EAN of the metal in the following metal nitrosyl. **4**

i) $[Mn(CO)(No)_3]^0$ ii) $[CO(No)(NH_3)_5]^{2+}$

iii) $\left[Fe\left(N^+O\right)_2(PR_3)_2\right]^0$ iv) $\left[Co(CO)_3\left(N^+O\right)\right]^0$

f) What are Vaska's Compound? Give its preparation and properties. **4**

5. a) Explain Hole formulation with example. **2**

b) What is meant by High spin & low spin crossover. **2**

c) Arrange the following ligand in order to their trans effect NO, PR_3, CH_3, Br, Cl, H_2O **2**

d) Give any two synthetic applications of trans effect. **2**

e) Write the method of preparation of metal carbonyl. **2**

f) Draw the structure of **2**

i) $Ir_4(CO)_{12}$ ii) $Ru_3(CO)_{12}$

g) Define Dioxygen complex. **2**

h) Explain IR spectra in metal nitrosyl. **2**

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