M.Sc. (Part - I) (Chemistry) Second Semester Old

CHE-201 - Inorganic Chemistry-II Paper - V

P. Pages : 2 **GUG/W/18/2242**

Time : Three Hours * 1 7 3 9 * Max. Marks : 80

Notes : 1. Attempt all questions.
2. All questions carry equal marks.

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

b) Explain. **8**
i) Abnormal magnetic properties of octahedral complexes with suitable example.
ii) Charge transfer spectra in $kmno_4$.

OR

c) Write note on Hole formulation with example. **4**

d) How is magnetic and spectral data useful for determination structure of Tetrachlorocobalt (II) complexes. **4**

e) Explain Racah parameter. **4**

f) Explain high-spin - low-spin crossover phenomenon in complexes with suitable example. **4**

2. a) What is trans effects? Discuss polarization and bonding theories of trans effect. **8**

b) What is inner sphere electron transfer reaction? How does the nature of bridging ligand affects the rate of electron transfer reaction & explain it's mechanism with suitable example. **8**

OR

c) Explain complementary and non-complementary electron transfer reaction. **4**

d) Write short note on: **4**
i) Tunneling effect ii) Cross reaction

e) Discuss substitution reaction in Pt (II) square planar complex. **4**

f) Give evidence to suggest that substitution in square planar complexes proceeds by S_N2 Mechanism. **4**

3. a) i) What are metal carbonyls? Discuss it's classification with suitable example. **8**
ii) Give any four methods of preparation mononuclear metal carbonyls.

b) How is vibrational spectroscopy used in explaining structure and bonding in metal carbonyls? Explain with suitable example. **8**

OR

c) How will you differentiate between terminal and bridging carbonyl groups on the 'basis of IR spectra of metal carbonyls. **4**

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

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

iii) $Os_4(CO)_{15}$ iv) $Os_4(CO)_{14}$

e) Explain synergic bonding in metal carbonyl. **4**

f) Calculate EAN of metal and state whether EAN rule is obeyed or not in the following **4**

i) $Ni(CO)_4$ ii) $Cr(CO)_6$

iii) $Os_4(CO)_{12}$ iv) $Fe_2(CO)_9$

4. a) Discuss the structure and bonding in metal nitrosyl. How will you identify linear and bent bond M-N-O? **8**

b) Discuss the structure and bonding in metal dinitrogen & dioxygen complex. **8**

OR

c) Discuss any four various reaction that occur in metal nitrosyl. **4**

d) Explain the chemistry of brown ring test with special reference to bonding aspects of nitrosyl species. **4**

e) What is Vaska's compound? Give its preparation & properties. **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) Explain Hund's rule. **2**

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

c) Give any two synthetic application of trans effect. **2**

d) Write note on bridge activated mechanism. **2**

e) What are π-acid ligands? Explain with example. **2**

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

g) Give IUPAC name and an application of following complex **2**
$\left[RhCl(PPh_3)_3\right]$

h) Explain the x-ray diffraction method used in metal nitrosyl complexes. **2**

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