M.Sc. F.Y. (Chemistry) (New CBCS Pattern) Sem-I

PSCCHT01 / CHE-101 - Inorganic Chemistry Paper-I

P. Pages : 2 **GUG/W/22/11183**

Time : Three Hours * 3 7 9 8 * Max. Marks : 80

Note : All questions are compulsory and carry equal marks.

1. a) i) State and Explain the John – Teller Theorem. **8**
ii) Describe d-orbital splitting in tetragonal complex.

b) What is VSEPR theory? Discuss the various rule proposed by Gillespie to explain the shape of covalent molecule. **8**

OR

c) What is nephelauxetic effect? Explain it with suitable example. **4**

d) What is Spectro-chemical series? Why it is so called? **4**

e) What are the bond pair; lane pair and geometry of following: **4**
i) $Xeof_2$ ii) Sf_6
iii) If_7 iv) $IC\,l_4^-$

f) Describe crystal field splitting in square planar complex. **4**

2. a) How is composition of complex determined in jobs method? Describe jobs method for the determination of stability constant of a complex. **8**

b) Discuss Stepwise and overall stability constant? Explain relation between them with suitable example. **8**

OR

c) What is acid hydrolysis of octahedral complexes? Explain the mechanism of following. **4**

$$cis\left[CO(en)_2OHCl\right]^+ + H_2O \rightarrow \left[CO(en)_2^{(OH)}(H_2O)\right]^{2+} + Cl^-$$

d) What are inert and labile complexes? $\left[Fe(H_2O)_6\right]^{3+}$ and $\left[Cr(H_2O)_6\right]^{3+}$ are equally stable thermodynamically but the former is labile where as the latter is inert why? **4**

e) Discuss how size, charge and basicity of ligand affect the stability of co-ordination complexes. **4**

f) Differentiate between SN^1 and SN^2 mechanism in base hydrolysis. **4**

3. a) What are carboranes? How are they classified? Draw polyhedral sketches for the following. **8**
i) $closo-1,5-C_2B_3H_5$
ii) $closo-1,2-C_2B_4H_6$
iii) $closo-1,7-C_2B_{10}H_{12}$

b) Explain structure and bonding in diborane with suitable diagram give methods for the preparation of diborane. **8**

OR

c) Sketch the possible topological structure in term of Styx numbers for the following boranes **4**

i) B_3H_9 ii) B_4H_{10}

iii) B_4H_{10} iv) B_5H_9

d) Give any two methods for preparation of metallocarboranes. **4**

e) What are metalloboranes? Discuss structure and bonding in $[fe(CO)_3 B_4H_8]$ **4**

f) Describe in detail structure and bonding in $B_{10} H_{14}$ (nido – decaborane – 14) **4**

4. a) What are isopoly and heteropoly acids? Describe how isopoly acids of M_O and W are prepared. Discuss structure of isopoly acid in general. **8**

b) What is meant by metal cluster? Give a detailed classification of metal cluster giving suitable examples. **8**

OR

c) Explain the structure of $[ReCl_8]^{2-}$. **4**

d) Discuss Kegg in theory used to explain the structure of heteropoly acids. **4**

e) Explain the metal – metal bonding in $M_O Cl_8^{4-}$ **4**

f) Write a note on oxide and alkoxide clusters. **4**

5. a) What are limitations of C.F.T. **2**

b) Explain why the bond angle in F_2O is smaller than H_2O. **2**

c) Write a short note on chelate effect. **2**

d) What is STYX number? **2**

e) What are boranes? How are they classified? **2**

f) Explain about acetate cluster with suitable examples. **2**

g) What are binuclear cluster of metal oxides. **2**

h) Write short note on Annation reaction. **2**

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