

M.Sc. F.Y. (Chemistry) (CBCS Pattern) Sem-I  
**PSCCHT01 - Inorganic Chemistry Paper-I**

P. Pages : 2

Time : Three Hours



**GUG/W/22/11183**

Max. Marks : 80

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1. a) Explain crystal field splitting for square planar and trigonal bipyramidal complexes. **8**
- b) 1) What are bond pair, lone pair and geometry of following. **8**  
i)  $\text{XeO}_4$  ii)  $\text{SF}_6$   
iii)  $\text{IF}_7$  iv)  $\text{XeO}_2\text{F}_2$   
2) Discuss Jahn – Teller effect

**OR**

- c) Discuss Bent Rule and energetics of hybridisation. **4**
- d) Explain the reduction of bond angle in **4**  
 $\text{H}_2\text{O} (104.5^\circ) > \text{H}_2\text{S} (92^\circ) > \text{H}_2\text{Se} (91^\circ)$
- e) Explain the following. **4**  
i) Stereochemical series  
ii) Nephelauxetic effect
- f) Discuss the d – orbital splitting in tetragonally distorted complexes. **4**
2. a) Explain the  $\text{SN}^1$  CB mechanism for the base hydrolysis with suitable example. **8**  
Give the evidences in favour of  $\text{SN}^1$  CB mechanism.
- b) Explain stepwise and overall formation constant of metal complexes. Discuss various **8**  
factors affecting stability constant of metal complexes.

**OR**

- c) Describe Job's method for determining stability constant of complex. **4**
- d) Discuss the reaction without metal ligand bond breaking with suitable example. **4**
- e) Explain the potentiometric method for determination of formation constant. **4**
- f) What is acid hydrolysis? Explain various stability constant of complex. **4**
3. a) i) What is meant by T (3c - 2e) bond and S(3c - 2e) in higher boranes? Explain with **8**  
suitable example.  
ii) Draw the structure and bonding in  $\text{B}_4\text{H}_{10}$

b) Explain the chemistry of metalloboranes and metallocarboranes with suitable example. 8

**OR**

c) Explain classification of boranes. 4

d) Discuss STYX number for higher boranes and their utilities. 4

e) Describe detail structure and bonding in  $B_{10}H_{14}$  4

f) Give the preparation of carboranes. 4

4. a) What is iso and heteropoly acids? Explain the Keggin theory with structure? 8

b) What is metal cluster? How are they classified? Write brief account of bonding in metal cluster. 8

**OR**

c) Explain the stereochemistry aspect of Re metal cluster. 4

d) Give two examples of tetranuclear complexes of acetate cluster. 4

e) What is metal – metal bond? Explain its formation considering molecular orbital theory. 4

f) Discuss the applications of poly acids. 4

5. a) Give the name of following compounds 2

i)  $B_5H_{11}$

ii)  $B_5H_8$

b) Write the limitation of CFT. 2

c) Give the classification of carboranes. 2

d) Draw structure of  $Re_2 Cl_8^{2-}$  cluster. 2

e) Write a short note on chelation effect. 2

f) Explain the various spectrochemical rules for VSEPR theory. 2

g) Give two examples of isopoly acids. 2

h) Explain the effect of metal ion on stability of complex. 2

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