

M.Sc.(Chemistry) (CBCS Pattern) Semester - I
PSCCHT01 - Inorganic Chemistry Paper-I

P. Pages : 2

Time : Three Hours



GUG/S/23/11183

Max. Marks : 80

-
- Notes : 1. All questions are compulsory & carry equal marks.
2. Draw suitable diagrams wherever necessary.

1. a) What is VSEPR theory? Discuss various stereo chemical rules to explain shape of covalent molecule. **8**
- b) What is crystal field splitting? Explain the splitting of d-orbital in square planar and trigonal bipyramidal complexes. **8**

OR

- c) Discuss the John-Teller effect in detail with example. **4**
- d) Discuss the bent rule in detail with example. **4**
- e) Explain the reduction of bond angle in $\text{H}_2\text{O}(104.5^\circ) > \text{H}_2\text{S}(92^\circ) > \text{H}_2\text{Se}(91^\circ)$. **4**
- f) Explain **4**
- i) Spectrochemical Series
- ii) Nephelauxetic effect.
2. a) What are the factors affecting the stability of metal complexes? Explain with suitable example? **8**
- b) Explain Conjugate base mechanism? Discuss direct and indirect evidences in favor of conjugate base mechanism? **8**

OR

- c) Discuss Job's method for the determination of stability constant of metal complexes? **4**
- d) Discuss the stepwise and overall formation constant. Give relation between them. **4**
- e) What is acid hydrolysis? Explain various factors affecting it? **4**
- f) Explain substitution in octahedral complexes without breaking of metal ligand bond with suitable example. **4**
3. a) What are boranes? Discuss the classification of borane with examples. **8**
- b) Discuss the classification of carboranes with suitable example. Give preparative methods of carboranes. **8**

OR

- c) Discuss any two methods for preparation of metallocarboranes? 4
- d) What is STYX number? Write their utility. 4
- e) Explain the following- 4
- i) closo-1,6-C₂B₄H₆ ii) nido-2,3-C₂B₄H₈
- f) Explain the structure and bonding in metalloboranes? 4
4. a) What is metal clusters? Discuss the bonding in metal cluster in detail by taking suitable examples? 8
- b) What are isopoly and heteropoly acid? Describe how isopoly acid of Mo and W are prepared. Discuss structure of isopoly acid in general. 8

OR

- c) Explain the structure of [Re₂Cl₈]²⁻ on the basis of M.O. theory. 4
- d) What is metal acetate cluster? Explain with suitable example. 4
- e) What is metal-metal bond? Explain its formation considering molecular orbital theory. 4
- f) Write a note on oxides and alkoxide clusters? 4
5. a) What are limitation of crystal field theory? 2
- b) Explain why the bond angle in F₂O is smaller than H₂O. 2
- c) Define inert and labile complexes. 2
- d) What is anation reaction? 2
- e) Write the rules for nomenclature of borane. 2
- f) Give the name of following compounds. 2
- i) B₅H₁₁ ii) B₅H₈
- g) What are binuclear clusters of metal acids? 2
- h) What are the difference between lower halide type and carbonyl type metal clusters? 2
