

Master of Science (M.Sc.) Semester-I (CBCS) (Chemistry) Examination

INORGANIC CHEMISTRY

Paper-1

Time: Three Hours

Maximum marks:60

1. (A) Discuss the geometry of ClF_3 molecule on the basis of VSEPR theory. Give any four limitations of VSEPR theory. 04

(B) Discuss the limitations of Crystal Field Theory with respect to: 04

(i) Spectrochemical series and

(ii) Nephelauxetic effect.

(C) Discuss d-orbital splitting in tetragonally distorted complex with suitable example. 04

OR

(D) Draw M.O. diagram of $[\text{Co}(\text{SCN}_4)]^{2-}$ complex ion and explain its magnetic behaviour. 04

(E) What is Jahn-Teller effect? Explain with suitable example. 04

(F) State and explain Bent's rule with suitable example. 04

2. (A) What do you understand by SN^1 conjugate base mechanism? Explain with suitable example. 04

(B) What is acid hydrolysis? Explain the factors affecting the rate of acid hydrolysis. 04

(C) How do the different characteristics of metal and ligand affect the stability of the complexes? 04

OR

(D) Define inert and labile complex. Explain inertness and lability in octahedral complex using CFT. 04

(E) Describe Irving-Rossotti method for the determination of stability constant of metal complex. 04

(F) What is base hydrolysis? Prove that an intermediate formed in base hydrolysis is TBP and not SP with suitable example. 04

3. (A) Give different synthetic routes for synthesis of higher boranes by pyrolysis method. 04

(B) What are metallocarboranes? Describe any one method of its preparation. 04

(C) What is STYX number? Sketch the possible topological structures of following in terms of STYX number: (i) B_4H_{10} and (ii) B_5H_{11} 04

OR

- (D) Write a note on metalloboranes with respect to its definition and preparation. 04
- (E) What are boranes? Give its classification with its general formulae. 04
- (F) Explain the utility of STYX number to explain the structure of B_5H_9 and B_5H_{11} . 04
4. (A) Discuss structure and bonding in octachlorodimolybdate anion. 04
- (B) Write short note on Pauling's theory of Heteropolyacids. 04
- (C) Draw the structure of following: Re_3Cl_9 and $[Re_3Cl_{12}]^{3-}$ ion. 04

OR

- (D) What is meant by Tetranuclear metal cluster? Discuss the structure of $W_4(OR)_{16}$ metal clusters. 04
- (E) Explain formation of delta bond in metal acetate clusters. 04
- (F) Write industrial applications of Isopoly and Heteropoly acids. 04
- 5.(A) Draw M.O. diagram of $[NiCl_4]^{2-}$ complex ion and explain its magnetic property. 04
- (B) What is annation reaction? Explain with suitable example. 04
- (C) Sketch the polyhedral structures of following molecules: 04
- (i) nido- B_5H_9 .
- (ii) closo-1,5- $C_2B_3H_5$.
- (iii) closo-1,2- $C_2B_{10}H_{12}$.
- (iv) nido-2- CB_5H_9 .
- (D) Discuss the factors favouring the formation of M-M bond. 04