

(3 Hours)

[ Total Marks : 80

- N.B. : (1) Question No. 1 is compulsory.  
 (2) Attempt any three questions from remaining five questions.

1. Answer any four of the following :-

- (a) Explain the structure of  $\text{PCl}_5$  molecule on the basis of VSEPR theory. 20
- (b) Write IUPAC names of the following co-ordination compounds.
- (i)  $[\text{Pt}(\text{NH}_3)_6]\text{Cl}_6$
- (ii)  $[\text{Co}(\text{NH}_3)_3\text{Cl}]\text{Cl}_2$
- (c) Explain Pinacol-Pinacolone reaction with mechanism.
- (d) Explain preparation, properties and bonding involved in  $\text{Fe}(\text{CO})_5$ .
- (e) Explain thermodynamically & kinetically controlled reactions. Hence, explain sulphonation of naphthalene.
- (f) What is  $\text{SN}^2$  reaction ? Explain with mechanism.
2. (a) Draw molecular orbital diagram for NO molecule and comment on its bond order and magnetic properties. 5
- (b) What is EAN ? Calculate EAN of  $[\text{Fe}(\text{CO})_5]$ . EAN = 36 5
- (c) Explain with suitable example role of inductive effect and resonance effect in stability of carbocations. 5
- (d) Explain why nitrobenzene on nitration forms m-dinitrobenzene as major product. 5
3. (a) Give an account of reactions during which carbon free radicals are generated. 5
- (b) Write chemical formula of the following co-ordination compounds. 5
- (i) Dibromodiaquodiammine cobalt (III) chloride  $[\text{CoBr}_2(\text{H}_2\text{O})_2(\text{NH}_3)_2]\text{Cl}$  C = 1
- (ii) Tetracarbonyl nickel (0)  $[\text{Ni}(\text{CO})_4]$  C = 3
- (c) Explain biochemistry of enzyme containing zinc. 5
- (d) Differentiate between Transition state and Intermediate. 5
4. (a) Explain  $\text{E}_2$  reaction with suitable example. 5
- (b) Differentiate between Bonding and Antibonding molecular orbitals. 5
- (c) Discuss briefly the Werner's theory of co-ordination compounds with respect to complexes of Cobalt. 5
- (d) Explain applications of cytochromes. 5

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5. (a) Explain structure and stability of carbenes. 5  
(b) Explain Friedel Craft's Alkylation with mechanism. 5  
(c) Illustrate with examples geometrical isomerism in co-ordinate compounds with co-ordination number 4 & 6. 5  
(d) Write a note on hydrogen bonding. 5
6. (a) Give mechanism & application of Michael reaction. 5  
(b) What do you understand by CFSE ? Find the CFSE for  $d^9$  of octahedral complex. 5  
(c) Write mechanism for electrophilic substitution in benzene. 5  
(d) What are drawbacks of Valence Bond Theory. 5
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