

**Q.P. Code : 536504**

**( 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 : **20**
- (a) Discuss the effect of lone pairs on the geometry of  $\text{NH}_3$ .
  - (b) Explain method of preparation, properties and structure of  $\text{Fe}_2(\text{CO})_9$ .
  - (c) During sulphonation of naphthalene at  $160^\circ\text{C}$ , which product will predominate? Justify your answer.
  - (d) Write IUPAC names of the following co-ordination compounds:
    - (i)  $[\text{Pt}(\text{NH}_3)_4(\text{en})]\text{Cl}_4$
    - (ii)  $\text{Na}[\text{Mn}(\text{CO})_5]$
  - (e) Write the reaction and mechanism of Reimer-Tiemann reaction.
  - (f) Explain the mechanism of Nucleophilic substitution reaction, that involves the racemisation of product.
2. (a) Write the chemical formula of the following co-ordination compounds: **5**
  - (i) Potassium tetracyano nickelate (II)
  - (ii) Tetra hydroxo zincate (III) ion
- (b) What is an Elimination reaction? Compare between  $\text{E}_1$  and  $\text{E}_2$  reactions. **5**
- (c) Explain the role of zinc metal in biological reaction. **5**
- (d) Draw Molecular Orbital diagram for CO molecule. Calculate its bond order and comment on its magnetic behaviour. **5**
3. (a) What is EAN? Calculate EAN of  $[\text{Cu}(\text{CN})_4]^{3-}$ . **5**
- (b) Differentiate between Bonding and Antibonding Molecular Orbitals. **5**
- (c) Explain stability of carbanion with respect to inductive effect and resonance. **5**
- (d) Differentiate between transition state and intermediate. **5**
4. (a) What is CFSE? Calculate CFSE of  $d^5$  and  $d^9$  in tetrahedral complexes. **5**
- (b) With the help of labelled Molecular Orbital, explain why  $[\text{Fe}(\text{CN})_6]^{3-}$  is paramagnetic and  $[\text{Fe}(\text{CN})_6]^{4-}$  is diamagnetic. **5**
- (c) Explain the role of Fe in Haemoglobin. **5**
- (d) What is Nucleophilic substitution reaction? Explain the mechanism of  $\text{SN}^2$  reaction. **5**

**TURN OVER**



5. (a) Write pinacol- pinacolone reaction w.r.t. unsymmetrical diol. 5  
(b) Draw Molecular Orbital diagram for  $N_2$  molecule. Calculate its bond order and comment on its magnetic behaviour. 5  
(c) Write note on Werner's theory. 5  
(d) Explain biochemistry of enzyme containing copper. 5
6. (a) Explain the electrophilic substitution in case of aniline in acidic medium. 5  
(b) What is Geometrical Isomerism? Draw Geometrical Isomers of  $[Co(en)_2Cl_2]^+$ . 5  
(c) Write note on Hydrogen bonding. 5  
(d) What are free radicals? Compare the stability of tertiary, secondary, primary and methyl free radicals. Justify your answer. 5
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