

April 2025
B.A./B.Sc.
Sixth Semester
CORE – 13
CHEMISTRY
Course Code: CHC 6.11
(Inorganic Chemistry - IV)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Explain the structure of $Mn_2(CO)_{10}$ according to VBT. Does it follow 18-electron rule? 3+2=5
(b) Discuss the structure of carbon monoxide according to VBT. 3
(c) What is the valence electron of the central metal M in $[M(CO)_7]^+$ which follow 18-electron rule? 2
(d) What is an electron deficient organometallic compound? Give an example. Mention two characteristics of it. 1+1+2=4

2. (a) Discuss the classification of carbonyls according to their structure. 4
(b) Define hapticity. Explain pentahepto and hexahepto ligands with one example each. 1+4=5
(c) Give one method of preparation of $Fe(CO)_5$. Explain its structure according to VBT. 1+3=4
(d) Define 18 electron rule. 1

UNIT-II

3. (a) Compare evidence of synergic effect of Zeise's salt with that of carbonyls. 6
(b) Give the metalation reaction of ferrocene. 4
(c) Discuss the structure of ferrocene. 4

4. (a) Compare the aromaticity of ferrocene with that of benzene. 4

- (b) Discuss in detail the concept of multicentre bonding in triethyl aluminium. 6
- (c) What is Mannich condensation? Give reactions. 4

UNIT-III

5. (a) Discuss the industrial process and mechanism of Wacker process for the manufacture of acetaldehyde from ethylene. 6
- (b) Write short notes on the following: $2 \times 2 = 4$
- (i) Nucleophilic attack on the coordinated ligands
- (ii) Insertion and elimination reactions
- (c) Write the importance of homogenous catalysis in industrial processes with reference to organometallic compounds. 4
6. (a) Explain in detail, the hydrogenation of alkene by Wilkinsons catalyst. 6
- (b) Write short notes on the following: $2 \times 2 = 4$
- (i) Activation of small molecules by complexation
- (ii) Oxidative addition and reductive elimination reactions
- (c) Discuss the industrial process of Synthetic gasoline (Fischer-Tropsch reaction). 4

UNIT-IV

7. (a) Discuss the stability of complex ions in solution. 3
- (b) Explain the type of intermediate form in S_N^1 mechanism in octahedral complexes. 4
- (c) What are labile complexes? Based on VBT explain the lability and inertness of octahedral complexes. $1+6=7$
8. (a) Discuss the factors affecting the stability of complex ions in solutions with reference to nature of the solvents and chelate affects. $2+3=5$
- (b) The hydrolysis of $\text{cis-}[\text{Co}(\text{en})_2(\text{OH})\text{Cl}]^+$ is faster than $\text{cis-}[\text{Co}(\text{en})_2(\text{NH}_3)\text{Cl}]^{2+}$. Explain with chemical equations. 5
- (c) What conclusions can be drawn from the VBT and CFT about the inertness and lability of octahedral complexes? 4

UNIT-V

9. (a) State trans effect. Explain polarization theory of trans effect with diagrams. 1+5=6
- (b) Discuss factors affecting the rate of substitution reaction in square planar complexes. 5
- (c) Write a note on lability of non-transition metal complexes. 3
10. (a) Discuss the applications of trans effect. 5
- (b) Explain S_N^2 mechanism for the substitution reaction of square planar complexes with suitable diagrams. 5
- (c) Explain kinetics reaction rate of octahedral complexes. 4
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