2024
M.Sc.
Second Semester
CORE – 05
CHEMISTRY
Course Code: MCHC 2.11
(Inorganic Chemistry - II)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Explain LNCC and HNCC. Give two examples for each and draw their structures. 1½+1½+4=7
   (b) Explain the importance of O_2-ligands in our life. 5
   (c) Give one method for preparation of transition metal complex containing t-phosphine as a ligand. 2

2. (a) Determine the structure (closo/nido/arathro) of the following: 2×4=8
   (i) $Os_5(CO)_{16}$
   (ii) $Os_5C(CO)_{15}$
   (iii) $[H_3Ru_4(CO)_{12}]^-$
   (iv) $[Fe_4C(CO)_{12}]^{-2}$
   (b) Give one method of preparation of $Mn_2(CO)_{10}$ and explain its structure on the basis of valence bond theory. Mention its magnetic nature. 2+3+1=6

UNIT–II

3. (a) Discuss the main features of $S_N1(CB)$ mechanism for base hydrolysis. 4
   (b) Explain, why the acid hydrolysis of cis-$[Co(en)_2Cl(OH)]^+$ is much faster than that of trans-$[Co(en)_2Cl(OH)]^+$. 5
   (c) Write notes on the pathways of racemisation in tris-chelate complexes with examples. 5

4. (a) Discuss what type of mechanism for acid hydrolysis of octahedral complexes is suggested by the charge on the complex and basicity of the ligands. 3+3=6
   (b) What is trans-effect? Discuss any one application of trans effect with chemical reaction. 1+2=3
   (c) Explain with one example each, the outer sphere and inner sphere mechanism of electron transfer reactions with suitable examples. 2½+2½=5

UNIT–III

5. (a) Give a brief review of metal alkyl compounds. 5
   (b) Discuss the method of preparation of M-C σ bond compounds by alkylation method. 4
   (c) What are metal carbynes? Give a method of preparation of high valent carbyne complex. 2+3=5

6. (a) Explain how M-C σ bond compound prepared by oxidation-addition reactions. 4
   (b) What are metal carbenes? How are they prepared? Discuss bonding in Fischer carbene complexes. 1+2+3=5
   (c) What are π-bond complexes? Discuss how the π-bond complexes of four membered rings are obtained. 1+4=5

UNIT–IV

7. (a) Give one method for the preparation of ferrocene. Write the reactions of ferrocene with bromine and mercuric acetate. 1+1½+1½=4
   (b) Write the oxidation and substitution reaction of $(\eta^6\text{–}C_6H_6)_2Cr$. 2+2=4
   (c) What do you mean by arene metal group complexes? Give the two methods of preparation of arene metal complexes. 2+4=6

8. (a) What do you mean by cyclopentadienyl? Give the two methods of preparation of metallocene. 2+4=6

(b) Write the Friedel-Craft acylation and redox reactions of $(\eta^6\text{–}C_6H_6)_2Cr$. 2+2=4

(c) Give the synthesis and reaction of the following: 2×2=4

(i) Cyclopentadienyl metal carbonyls

(ii) Cyclopentadienyl metal hydrides

UNIT–V

9. (a) Explain with mechanism, how hydrozirconation of terminal and internal double bonds isomerised to terminal alkyl form. 5

(b) What is Collman's reagent? Give the chemical reactions how it can be used to convert:

(i) Acid chlorides to aldehydes

(ii) Alkyl halides to carboxylic acids 1+2+2=5

(c) Write the mechanism of homogeneous hydrogenation by using Wilkinson's catalyst. 4

10. (a) Give any six chemical reactions on how Schwartz's reagent reacts with alkyne to synthesize various organic compounds. 6

(b) Write the mechanism how ketone is produced from alkyne by hydrozirconation-carbonylation coupling reaction. 4

(c) With chemical reactions, explain how glycol can be synthesized by hydrogenation. 4