2022

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) What are LNCC and HNCC? Give one example for each. 2+2=4
   (b) Find out the structure (closo/arachno/nido) of the following: 2×3=6
   (i) $[H_3Ru_4(CO)_{12}]^-$
   (ii) $OS_5(CO)_{16}$
   (iii) $Fe_4C(CO)_{12}]^{-2}$
   (c) What are capping rules? Give one example. 3+1=4

2. (a) What are carbonyl clusters? Draw the structure of: 3
   (i) $Fe_3(CO)_{12}$
   (ii) $Mn_2(CO)_{10}$
   (b) Give one method of preparation of transition metal complexes with NO ligand. 3
   (c) Explain the importance of O_2^- ligand in our life. 5
   (d) Write short note on supramolecular chemistry. 3

UNIT–II

3. (a) Explain in what way acid hydrolysis of cis-$[Co(en)_2(OH)Cl]^+$ complex differs from that of trans-$[Co(en)_2(NO_2)Cl]^+$ complex. 6
   (b) What is trans effect? Show the stereochemistry of substitution in the following reactions: $[PtCl_4]^{2-} \xrightarrow{NO_2} ? \xrightarrow{NH_3} ?$ 1+2=3

(c) Discuss the complimentary and non-complimentary two electron transfer reactions giving suitable examples. 5

4. (a) What do you understand by S_N^1(CB) mechanism? Explain with suitable example. 1+4=5
   (b) What is an anation reaction? Discuss. 1+2=3
   (c) Give an account on the isomerisation and racemisation of tris chelate complexes. 6

UNIT–III

5. (a) What are mono nuclear metal alkyls? Give examples. 2+1=3
   (b) What are Fischer carbene complexes? Explain binding in Fischer carbene complex. 2+3=5
   (c) Give any one method each of the preparation of 4+2=6
      (i) $M-C\sigma$ bond compounds
      (ii) Schrock carbenes

6. (a) Discuss the following : 3×2=6
      (i) $Os(o\text{-}MeC_6H_4)_4$ is more stable than $Os(Ph)_4$
      (ii) Metal alkylidyne complexes with an example
   (b) Explain the insertion reaction of $M-C\sigma$ bonds. 4
   (c) What are low valent carbyne complexes? Discuss. 1+3=4

UNIT–IV

7. (a) What do you mean by cyclopentadienyl? Give the two methods of preparation of metallocenes. 2+4=6
   (b) Give the synthesis and reaction of 2×2=4
      (i) cyclopentadienyl metal carbonyls
      (ii) cyclopentadienyl metal hydrides
   (c) Write the oxidation and substitution reaction of $(\eta^6-C_6H_6)_2Cr$. 2+2=4

8. (a) What do you mean by arene metal group complexes? Give the two methods of preparation of arene metal complexes. 2+4=6

(b) Give one method for the preparation of ferrocene. Write the reactions of ferrocene with bromine and mercuric acetate. 1+1½+1½=4

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

UNIT–V

9. (a) Write short notes on the following: 2×2=4
   (i) Importance of homogenous catalysis in organic synthesis
   (ii) Asymmetric epoxidation

   (b) Explain with mechanism the olefin oxidation by Wacker's process. 5

   (c) Give the preparation of Schwartz reagent. Show with example how this reagent is used to transform alkene and alkyne. 1+4=5

10. (a) Discuss briefly the production of acetic acid by Monsanto process. 3

    (b) What is Colman's reagent? Give one use of this reagent in organic synthesis. 1+2=3

    (c) Write notes on the following: 2×4=8
    (i) Heck's reaction
    (ii) Asymmetric hydrogenation
