2023

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) Discuss one method of preparation each of $Co_2(CO)_8$ and $Fe_2(CO)_9$. Draw their structures. 1½ ×2 +2=5
   (b) Calculate the number of metal-metal bonds in the following and draw their structure. 3×2=6
      (i) $Ir_4(CO)_{12}$
      (ii) $Ru_3(CO)_{12}$
   (c) Write a short note on Wade's rule. 3

2. (a) Find out the structure (closo/nido/arathro) of the following: 2×4=8
      (i) $Fe_5C(CO)_{15}$
      (ii) $Rh_6(CO)_{16}$
      (iii) $[Fe_4N(CO)_{12}]^-$
      (iv) $Ru_6C(CO)_{17}$
   (b) Give one method of preparation of transition metal complex with N_2 ligand. 2
   (c) Write the applications of supramolecular chemistry. 4

UNIT–II

3. (a) On the basis of valence bond theory, discuss the cause of lability and inertness of octahedral complexes. 5
   (b) What is an inert ligand? Discuss what type of intermediates and products will be formed if the inert ligand is a pi-acceptor. 1+2+2=5

(c) Write notes on fluxional coordination compounds with reference to trigonal bipyramidal molecules. 4

4. (a) Define base hydrolysis of octahedral complexes with an example. Mention any two points that S_N2 mechanism alone cannot explain base hydrolysis. 2+2=4

(b) Give any two evidence to suggest that substitution in square planar complexes proceeds through S_N2 mechanism. 5

(c) Discuss the fluxional organometallic compounds. 5

UNIT–III

5. (a) How are Fischer carbenes prepared from electron rich olefins? Give reactions. 3

(b) Discuss bonding in Schrock carbenes. 3

(c) What are low valent carbyne complexes? Give one method of preparation and discuss its bonding and structure. 2+2+4 =8

6. (a) What are $C_3R_3^+$ compounds? How are they prepared? Mention any of its reactions. 2+3+2=7

(b) Give the reactions of Fischer carbenes. 3

(c) What are vinylidenes? Give an example. 3+1=4

UNIT–IV

7. (a) What do you mean by cyclopentadiene? Give the chemical reaction for the preparation of metallocenes by the action of anhydrous transition metal(II) halide (MX_2) on alkali metal cyclopentadienides. 1+2=3

(b) Give the synthesis and reaction of cyclopentadienyl metal halides. 2

(c) Write the physical properties of arene complexes with special reference to $(\eta^6\text{–}C_6H_6)_2Cr$. 2

(d) Write the reactions of the following for ferrocene: 2½×2=5

(i) Friedel-Craft's alkylation

(ii) Mannich condensation amino methylation

(e) Give the reaction of $Cr(\eta^6\text{–}C_6H_6)_2$ with alkyl halides. 2

8. (a) Explain the structure and bonding in ferrocene. 4

(b) Write the metallation and substitution reactions of $Cr(\eta^6-C_6H_6)_2$. 2+2=4

(c) Give the Fischer's reducing Friedel Craft's method for the preparation of arene metal complexes. 2

(d) Give the physical properties of ferrocene. How ferrocene can be prepared in the laboratory? 2+2=4

UNIT–V

9. (a) Write note on hydrozirconation of alkene and alkyne. 4

(b) Explain with mechanism the synthesis of acetaldehyde from ethene using tetrachloropalladate(II) ion as catalyst. 5

(c) Briefly explain the vinylation of olefins with mechanism by Heck's reaction. 5

10. (a) Discuss the applications of η^4 -diene iron tricarbonyls in organic synthesis. 5

(b) Write notes on the following: 3×2=6

(i) Asymmetric epoxidation

(ii) Asymmetric hydrogenation

(c) Explain the synthesis of acetic acid by Monsanto process. 3