2024
B.A./B.Sc.
Sixth Semester
CORE – 13
CHEMISTRY
Course Code: CHC 6.11
(Inorganic Chemistry - IV)

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

Answer <u>five</u> *questions, taking* <u>one</u> *from each unit.*

UNIT–I

1. (a) Explain dihapto, tri hapto, and tetra hapto ligands with examples.

                  $2 \times 3 = 6$

    (b) Determine whether the following carbonyls follow the 18e rule
    or not: $1\frac{1}{2} \times 4 = 6$
    - (i) $Mn_2(CO)_{10}$
    - (ii) $Fe_2(CO)_9$
    - (iii) $Cr(CO)_6$
    - (iv) $Ni(CO)_4$

    (c) Explain the structure of $Fe(CO)_5$ according to VBT.   2

2. (a) Draw the MO energy level diagram of carbon monoxide (CO) by
    Coulson.   4

    (b) Give one method of preparation of $Fe_2(CO)_9$. Explain its structure by
    VBT. $2+2=4$

    (c) What are ionic organometallic compounds? Give two examples and
    mention its characteristics. $1+1+4=6$

UNIT–II

3. (a) Discuss in detail the alkene polymerization by Ziegler-Natta catalyst.

                  4

    (b) Explain the Schlenk equilibrium.   4

    (c) Discuss in detail bonding in trialkyl aluminium compound.   6

4. (a) Discuss the bonding in Zeise's salt. 4
   (b) Give the commercial method of preparation of ferrocene. Give the alkylation and acetylation reactions of ferrocene. 2+4=6
   (c) Give reasons why is ferrocene more reactive than benzene. 4

UNIT–III

5. (a) Give the comparison between homogeneous and heterogeneous catalysts. 4
   (b) Write short notes on the following: 2×2=4
      (i) Insertion reactions
      (ii) Oxidative addition reactions
   (c) Discuss the industrial process and mechanism of Monsanto acetic acid synthesis. 6

6. (a) What are the disadvantages of oxo-process using $Co_2(CO)_8$ as catalyst? 4
   (b) Write short notes on the following: 2×2=4
      (i) Ligand coordination
      (ii) Coordinative unsaturation
   (c) Discuss the industrial process and mechanism of synthesis gas by metal carbonyl complexes. 6

UNIT–IV

7. (a) What are labile and inert complexes? Explain with suitable examples. 2+2=4
   (b) Discuss the factors affecting the stability of complexes in solutions with reference to basic nature of ligands and entropy change. 2+2=4
   (c) Explain with chemical equation, rate of aquation of $Cis[Co(en)_2(OH)Cl]^+$ is much faster than that of $trans[Co(en)_2(OH)Cl]^+$. 6

8. (a) Explain the type of intermediate form in S_N2 mechanism in octahedral complexes. 4

(b) What is acid hydrolysis? Discuss acid hydrolysis in octahedral complexes. 1+3=4

(c) What is CFAE? On the basis of CFT, discuss the cause of lability and inertness of octahedral complexes in S_N1 and S_N2 mechanism. 1+5=6

UNIT–V

9. (a) With chemical reaction, mention the three ways to bring about the substitution reaction in square planar complexes. 3

(b) Discuss any two evidence to support that substitution reaction in square planar complexes should proceed through S_N2 mechanism. 2½×2 =5

(c) What is trans effect? Explain the pi-bonding theory of trans effect. 1+5=6

10. (a) Discuss the four factors which determine the lability of complexes formed by non-transition elements. 4

(b) Explain the ligand field effects and reaction rates in octahedral complexes. 5

(c) Discuss how 'trans effect', affect the substitution reaction in square planar complex. 5

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