2022

B.A./B.Sc.

Fourth Semester

CORE – 8

CHEMISTRY

Course Code: CHC 4.11

(Inorganic Chemistry – III)

Total Mark: 70 *Pass Mark: 28*

Time: 3 hours

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

UNIT–I

1. (a) Define labile and inert complexes with example. 2
   (b) What are cheating ligands and chelate complex? Give example. 2
   (c) Write the IUPAC of: 1×2=2
      (i) $K_4[Ni(CN)_4]$
      (ii) $[Pt\ Cl(NO_2)(NH_3)_4]\ SO_4$
   (d) Discuss the geometrical isomerism exhibited by complexes with coordination number 4 (four). 4
   (e) The complex ion $[Co(NH_3)_6]^{+3}$ is octahedral and diamagnetic, the complex ion $[CoF_6]^{-3}$ is also octahedral but paramagnetic. How does VBT account for this observation? 4

2. (a) Write the formula of the following: 1×2=2
      (i) Dichlorobis(ethylenediamine) cobalt(III) sulphate.
      (ii) Potassium hexacyanoferrate(III)
   (b) Explain hydrate isomerism and ionization isomerism with example. 4
   (c) Write the main postulate of Werner's theory. Based on Werner's theory, deduce the structure of $CoCl_3.6NH_3$ complex. 2+2=4
   (d) Write the optical isomerism exhibited by complexes with coordination number 6 (six). 4

UNIT–II

3. (a) Discuss briefly the splitting of a d–orbital in octahedral complexes. 4
   (b) Give the important postulates of CFT. 4
   (c) On the basis of CFT, explain magnetic properties of: 2×3=6
      (i) $[CoF_6]^{-3}$
      (ii) $[Fe\ (CN)_6]^{-4}$
      (iii) $[Fe\ (H_2O)_6]^{+2}$

4. (a) Compare octahedral and tetrahedral complexes by taking their CFSE into account and plot a graph. 6
   (b) State Jahn–Teller distortion. 1
   (c) Which of the following has stronger JTD? Give reason. 4
      (i) $[Cu\ (H_2O)_6]^{+2}$
      (ii) $[Mn\ (H_2O)_6]^{+2}$
   (d) Calculate CFSE of the following: 1½×2=3
      (i) Fe^{+2} (octahedral HS)
      (ii) Co^{+2} (octahedral LS)

UNIT–III

5. (a) How is $TiCl_4$ prepared? Give its important uses. 2+2=4
   (b) Discuss the aqueous chemistry of Cr in various oxidation states and give the structure of the complex formed by Cr^{+2} ion. 3+2=5
   (c) Write general electronic configuration of first transition series. Why do these elements exhibit predominantly an oxidation state of +2? 1+2=3
   (d) Write a note on catalytic properties of transition elements. 2

6. (a) Differentiate between second and third transition series. 4
   (b) Write notes on transition elements with respect to: 2×3=6
      (i) Colouration properties
      (ii) Complex formation
      (iii) Magnetic properties
   (c) What are the various oxidation states of vanadium? How would you account for them? 4

UNIT–IV

7. (a) Write notes on the oxidation states and spectral properties of lanthanoids. 2½+2½=5
   (b) Give the electronic configuration of Np (Z=93) and Fm (Z=100). Discuss how the magnetic properties of lanthanoids differ from transition metals. 2+4=6
   (c) Write any one method of preparation of UF_6. Draw the structure and mention its uses. 1+2=3

8. (a) Why do +4 electrons in lanthanoids not take part in chemical bonding? Write the electronic configuration of Pr (Z=59) and Gd (Z=64). 1+2=3
   (b) What are the consequences of lanthanoid contraction? Discuss the extraction of lanthanoid from monazite sand. 2+4=6
   (c) What are actinoids? Discuss how you would prepare Np, Pu and Am from U. 1+4=5

UNIT–V

9. (a) What are metalloenzymes? Describe any one of Zn metalloenzyme. 2+4=6
   (b) Mention the metal ion present in chlorophyll. 1
   (c) Explain the Na^+/K^+ pump. 3
   (d) Write short notes on the following: 2×2=4
      (i) Auranofin
      (ii) Cisplatin

10. (a) What is heme protein? 2
    (b) Mention two toxic effects of mercury. 2
    (c) Mention the excesses and deficiency of any two trace elements. 2½+2½=5
    (d) Explain the function of haemoglobin in biological system. 5
