

Exam. Code : 107401

Subject Code : 1712

B.Sc. Biotechnology 1st Semester (Batch 2021-24)

CHEMISTRY—I (Inorganic Chemistry)

Paper—BTL105

Time Allowed—3 Hours] [Maximum Marks—40

Note :— Attempt FIVE questions in all, selecting at least ONE question from each Section. The fifth question may be attempted from any Section. All questions carry equal marks.

SECTION—A

1. (a) Discuss with examples the stereochemistry of complexes having coordination number eight. 4
- (b) Draw all the possible isomers of :
 - (i) $[\text{Cr}(\text{en})_2\text{Cl}_2]^+$
 - (ii) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ 4
2. (a) Write down the IUPAC names of the following compounds:
 - (i) $[\text{Pd}(\text{H}_2\text{O})_2(\text{ONO})_2\text{I}_2]$
 - (ii) $[\text{Fe}(\text{CN})_5(\text{NO})]^{3-}$
 - (iii) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$. 4

- (b) Draw the geometrical isomers of complex $[\text{Rh}(\text{en})_2\text{Cl}_2]^+$. Which among them is optically active form and why ? 4

SECTION—B

3. (a) What is the hybridization and geometry of complex, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ according to valence bond theory ? 4
(b) What are inner orbital complexes ? Explain it with example. 4
4. (a) Write down the applications of valence bond theory. 4
(b) What is back bonding ? Discuss it in detail by taking suitable example. 4

SECTION—C

5. (a) Write a short note on cryptands. 4
(b) What are macrocyclic ligands ? How they are different from other ligands ? 4
6. (a) Discuss the stability of coordination compounds in detail. 4
(b) Draw the structure of dibenzo-18-crown-6 ether and cryptand-222. 4

SECTION—D

7. (a) Explain, how crystal field splitting occurs in octahedral complexes ? 4
(b) Write down the factors which affect the crystal field stabilization value in metal complexes. 4

8. (a) Which of the two $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ has larger Δ_o and why ? 4
(b) Calculate crystal field stabilization energies for the following :
(i) d^5 high spin octahedral
(ii) d^6 low spin octahedral
(iii) d^4 low spin tetrahedral
(iv) d^6 low spin tetrahedral 4