

Exam. Code : 107401

Subject Code : 1818

B.Sc. Biotechnology 1st Semester

INORGANIC CHEMISTRY—A

Paper—BT-3

Time Allowed—Three Hours] [Maximum Marks—40

Note :— There are **FOUR** sections (A, B, C and D) in question paper containing **TWO** questions in each section. Candidates are required to attempt **FIVE** questions, selecting at least **ONE** question from each section. The **fifth** question may be attempted from any section.

SECTION—A

1. (a) Write down the name of the following coordination complexes :



(b) How does Werner's coordination theory account for ionic nature of complex, $\text{CoCl}_3 \cdot 4\text{NH}_3$? Explain.

3

- (c) Discuss the following with at least one example :
- (i) Ionisation isomerism
 - (ii) Coordination isomerism
 - (iii) Linkage isomerism. 3
2. (a) Draw the structures of all possible geometrical and optical isomers. 4
- (b) Define coordination number. Discuss the geometries adopted by complexes with coordination number 3 to 6. 4

SECTION—B

3. (a) What do you mean by Inner orbital complexes ? Explain in detail, which among the following is inner orbital complex :
- (i) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 - (ii) $[\text{CoF}_6]^{3-}$ 4
- (b) How does Valence Bond Theory account for the following :
- (i) $[\text{Fe}(\text{CN})_6]^{4-}$ is diamagnetic while $[\text{Fe}(\text{CN})_6]^{3-}$ is paramagnetic.
 - (ii) $[\text{NiCl}_4]^{2-}$ is paramagnetic and tetrahedral. 4

4. (a) What do you mean by back bonding ? Explain it with suitable example. 4

(b) Write down the limitations of valence bond theory. 4

SECTION—C

5. (a) Which of the following complexes has the larger crystal field splitting of d-orbital and why :

(i) $[\text{Co}(\text{NH}_3)_6]^{3+}$ or $[\text{Rh}(\text{NH}_3)_6]^{3+}$

(ii) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ 2

(b) Define the following terms :

(i) Antiferromagnetism

(ii) Diamagnetism

(iii) Ferromagnetism. 3

(c) Calculate crystal field stabilization energies for the following :

(i) d^4 strong field octahedral

(ii) d^7 weak field octahedral. 3

6. (a) What is Jahn-Teller distortion effect ? Discuss the stability of Cu(II) complexes on the basis of J-T distortion. 4

(b) Explain how the orientation of d-orbitals in space leads their splitting in tetrahedral field of ligands. 4

SECTION—D

7. Draw the MOEL diagrams for following octahedral complexes, (i) high spin complex, $[\text{CoF}_6]^{3-}$ and (ii) low spin complex, $[\text{Co}(\text{NH}_3)_6]^{3+}$. Find out bonding, antibonding and non-bonding electrons in them. 8
8. (a) Write down the difference between bonding and antibonding molecular orbitals. 2
- (b) Write a short note on charge transfer transitions. 2
- (c) Draw the MOEL diagram of $[\text{CoCl}_4]^{2-}$, a tetrahedral complex. 4