Exam. Code : 107401
Subject Code : 1816

B.Sc. Biotechnology 1st Semester

INORGANIC CHEMISTRY—A

Paper—BT-3

Time Allowed—Three Hours] [Maximum Marks—40

Note :— **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 :

   (i) $[Co(en)_3]Cl_3$

   (ii) $[PtCl(NO_2)(NH_3)_4]SO_4$

   (iii) $Na_3[Co(NO_2)_6]$

   (iv) $NH_4[Cr(NCS)_4(NH_3)_2]$ 2

   (b) How does Werner's coordination theory account for non-ionic nature of complex $CoCl_3.3NH_3$? Explain. 3

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   (c) Discuss the isomerism exhibited in the following compounds :

   (i) $[Co(NO_2)(NH_3)_5]Cl_2$ and $[Co(ONO)(NH_3)_5]Cl_2$

   (ii) $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$

   (iii) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$ 3

2. (a) Discuss geometrical and optical isomers with suitable examples. http://www.gnduonline.com 4

   (b) What is meant by coordination number ? Discuss the geometries adopted by complexes with coordination number 5 to 8. 4

SECTION—B

3. (a) What do you mean by outer orbital complexes ? Explain in detail, which among the following is outer orbital complex :

   (a) $[Co(NH_3)_6]^{3+}$

   (b) $[CoF_6]^{3-}$ 4

   (b) Discuss the hybridization, geometry and number of unpaired electrons in following complexes :

   (a) $[Ni(CN)_4]^{2-}$

   (b) $[NiCl_4]^{2-}$ 4

4. (a) What do you understand by the concept 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 larger Δ_0 value and why ?

(a) $[Co(CN)_6]^{3-}$ or $[CoF_6]^{3-}$

(b) $[Co(H_2O)_6]^{2+}$ or $[Co(H_2O)_6]^{3+}$ 2

(b) Define the following terms :

(a) Antiferromagnetism

(b) Diamagnetism

(c) Ferromagnetism. 3

(c) Determine the ground state terms for high spin d^2 and d^7 configurations in octahedral symmetry. 3

6. (a) Explain the crystal field splitting in octahedral complex. 4

(b) Write down the factors on which crystal filed splitting energy depends. 4

SECTION—D

7. Draw the MOEL diagrams for $[Cr(CO)_6]$, an octahedral complex including both sigma and pi interactions. Find out bonding, antibonding and non-bonding electrons in it. 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 $[CoCl_4]^{2-}$, a tetrahedral complex. 4