



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 4th Semester Examination, 2023

CC8-CHEMISTRY**INORGANIC CHEMISTRY**

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

1. Answer any **five** questions: 1×5 = 5
- (a) Comment on optical activity of Ma_3b_3 type complex. 1
- (b) What is chelate effect? 1
- (c) What is inner metallic compound? 1
- (d) Write down the IUPAC name of $Na_2[Fe(CN)_5(NO)]$. 1
- (e) What is the bond multiplicity between two metal atoms in $[Cr(CH_3COO)_2H_2O]_2$? 1
- (f) What abnormality is caused due to Iodine deficiency? 1
- (g) What is pairing energy? 1
- (h) What is the drawback of valence bond theory? 1
2. Answer any **three** questions: 5×3 = 15
- (a) (i) $[Fe(CN)_6]^{4-}$ ion is diamagnetic and $[Fe(CN)_6]^{3-}$ ion is paramagnetic although both the ions containing strong ligands. Explain it with the help of CFT. 3
- (ii) How will you account for the purple color of $[Ti(H_2O)_6]^{3+}$? 2
- (b) (i) $CuSO_4 \cdot 5H_2O$ is blue in color why? It becomes deep blue on addition of excess NH_4OH solution. Explain. 3
- (ii) In terms of CFT, explain why Cu-OH₂ distance in $[Cu(H_2O)_6]^{2+}$ are not equal. 2
- (c) (i) What are the main differences in the magnetic behaviours among the elements of f-block and d-block? 3
- (ii) EDTA forms a strong complex with Lu(III) than with La(III). Explain. 2
- (d) What are the function of hemoglobin and myoglobin? What are similarities and differences in their structures? $2\frac{1}{2} + 2\frac{1}{2}$
- (e) (i) Write a short note on nitrogen fixation. $2\frac{1}{2}$
- (ii) Discuss the biological importance of Ca^{2+} . How is it different from that of Mg^{2+} ? $2\frac{1}{2}$

3. Answer any *two* questions: 10×2 = 20
- (a) (i) Draw the structures of all possible geometrical isomers of $[\text{Co}(\text{en})(\text{NH}_3)_2\text{Cl}_2]^+$ ion and also indicate the optically active species (en = ethylenediamine). 4
- (ii) The magnetic moment of a certain octahedral Co(II) complex is $4.0 \mu_B$. What is its d electron configuration? 3
- (iii) Why are low spin complexes not encountered for tetrahedral co-ordination? 2
- (iv) Calculate the number of unpaired electrons and CFSE for $[\text{Cr}(\text{NH}_3)_6]^{3+}$. 1
- (b) (i) What are ambidentate ligands? Give an example. 2
- (ii) Calculate the magnetic moment of $\text{K}_4[\text{Mn}(\text{CN})_6]$ and $\text{K}_4[\text{MnF}_6]$. 3
- (iii) For which d^n configurations would no Jahn Teller splitting be expected for the Tetrahedral case (ignore low spin case)? 2
- (iv) Why aqueous solution of Mn(II) sulphate is almost colorless? $1 \frac{1}{2}$
- (v) What is the hybridization and geometry of $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$? $1 \frac{1}{2}$
- (c) (i) What is actinoid contraction? 2
- (ii) Ln^{3+} ions show much less tendency towards complex formation compared to the d-block elements — Why? 2
- (iii) Why are oxocations not formed by Lanthanides? 2
- (iv) The magnetic character of actinoids are less than predicted from calculated value — Why? 2
- (v) The most stable oxidation state for Lanthanides is +3 — Justify. 2
- (d) (i) Write down the role of metalloenzymes which contains Zn^{2+} ion. 2
- (ii) What are essential and trace elements? Give examples of each. 3
- (iii) High spin iron(II) is too large for the opening of the porphyrin ring but low spin iron(II) can be accommodated in the opening, why does high spin iron(II) have a larger radius? 2
- (iv) Describe two types of chelation therapy in use. 3

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