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Sl. No.

M.Sc. II Semester Degree Examination, October - 2023

INDUSTRIAL CHEMISTRY

DSC 5 : Coordination Chemistry

(New Syllabus)

(NEP)

Time : 3 Hours Maximum Marks : 70

Note : *Answer **any five** of the following questions with Question No. **1** is **Compulsory**. Each question carries **equal** marks.*

1. (a) Draw the molecular orbital level diagram for $[CoF_6]^{3-}$ and account for the magnetic behaviour of the complex. **5+5+4=14**

(b) Write the salient features of CFT and explain the splitting of d-orbital in octahedral field.

(c) Calculate the CFSE for the complex $[Co(NH_3)_6]^{3+}$ and comment on magnetic moment.

2. (a) Draw orgel energy diagram for high spin octahedral complex of d^4 and d^7 ions and predict number of peaks in electronic spectra. **5+5+4=14**

(b) By taking suitable example, explain spin crossover and how spin crossover affect the magnetism.

(c) State the selection rules that govern electronic transition in coordination compounds and explain why d-d transition is not spin allowed in $[Mn(H_2O)_6]^{2+}$?

3. (a) Explain the determination of stability constant of a complex by spectroscopic method. **5+5+4=14**

(b) Write a note on overall stability constants.

(c) Discuss the mechanism of electron transfer reaction with reference to inner sphere reactions.

4. (a) Illustrate the mechanism of sodium and potassium ions transportation across cell membranes. **5+5+4=14**

(b) How atmosphere N_2 is fixed by nitrogenase enzymes ? Write the mechanism involved in the N_2 fixation.

(c) Discuss the structural features of haemoglobin and explain the uptake of O_2 by it.

P.T.O.

5. (a) Explain the use of ^{18}O labelling in the investigation of reaction mechanism of acid catalysed esterification. **5+5+4=14**

(b) Write a note on types of nuclear reactions.

(c) What is the binding energy for $^{11}_{5}B$ nucleus ? If its mass defect is 0.08181 amu.

6. (a) Discuss the magnetic properties of solids. **5+5+4=14**

(b) Explain different factors affecting stability constant.

(c) $[Cr(H_2O_6]^{2+}$ undergo outer sphere with $[Co(NH_3)_6]^{3+}$whereas with $[Co(NH_3)_5Cl]^{2+}$ an inner sphere electron transfer reactions. Justify your answer along with representative chemical equations.

7. (a) Sketch Z scheme of electron transfer in photosynthesis. **5+5+4=14**

(b) Write notes on :

(i) Siderophores

(ii) Structure of hemerythrin

(c) Write notes on :

(i) Radioisotopes in medicine

(ii) Nuclear reactions

8. (a) Enumerate on the biological role of zinc and cobalt. **5+5+4=14**

(b) Explain the substitution reaction in octahedral complex with suitable examples.

(c) What is ferroelectric phenomenon ? Explain this in $BaTiO_3$.

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