(6 pages) **Reg. No. :** .....

Code No. : 7423 **Sub. Code : ZCHM 42**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Fourth Semester

Chemistry — Core

BIO INORGANIC, SPECTRAL METHODS — II AND PHOTOCHEMISTRY

(For those who joined in July 2021 and 2022 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Non-cyclic photophosphorylation results in the formation of

   (a) NADPH and ATP

   (b) ADP

   (c) NADH

   (d) FAD

2. The electronic configuration of iron in deoxy haemoglobin is _____

   (a) t_{2g}^6 (b) $t_{2g}^4 eg^2$

   (c) t_{2g}^5 (d) $t_{2g}^3 eg^2$

3. The enzyme carboxy aldehyde dehydrogenase contains _____ iron sulphur proteins.

   (a) Fe_4S_4 (b) Fe_2S_3

   (c) Fe_2S_2 (d) Fe_3S_4

4. The coordination geometry of zinc ion in the active site of carbonic anhydrase is

   (a) square planar

   (b) trigonal bipyramid

   (c) octhahedral

   (d) tetrahedral

5. The Mossbauer Spectrum of $[Fe(H_2O)_6]^{3+}$ is a _____

   (a) quartet (b) two doublets

   (c) quintet (d) singlet

6. Which of the following has highest isomer shift?

   (a) Fe(III) (b) Fe(IV)

   (c) Fe(II) (d) Fe(V)

7. The ^{19}F nmr of ClF_3 consists of ————————

(a) singlet (b) doublet and triplet

(c) doublet and singlet (d) doublet

8. For a Cu(II) complex if $g_{11} > g \perp$ then ———— — orbital contains the unpaired electrons.

(a) $d_x^2 - y^2$ (b) d_{xz}

(c) d_{yz} (d) d_z^2

9. The non radiative transition $^4T_1 \rightarrow {}^4T_2$ is called ————————

(a) Internal Conversion

(b) Inter System Crossing

(c) Phosphorescence

(d) Fluorescence

10. $*[Ru(bpy)_3]^{+2} + MV^{+2} \rightarrow [Ru(bpy)_3]^{3+} + MV^{+}$ is ———————— reaction.

(a) Reductive quenching

(b) Energy quenching

(c) Oxidative quenching

(d) Photo isomerisation

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

11. (a) Discuss the structure and function of Fe_4S_4 cluster.

Or

(b) Explain the role of molybdenum atom in in vivo nitrogen fixation.

12. (a) Explain the structure and function of an enzyme which cleaves the carboxy terminal of a aminio acid in a polypetide.

Or

(b) Discuss the suitable method to find the binding sites of nucleic acids.

13. (a) Explain the nature of π bonding in sodium nitroprusside by Mossbauer spectroscopy.

Or

(b) Explain the Mossbauer spectrum of

(i) $FeSO_4.7H_20$ and

(ii) $Fe(CO)_5$.

14. (a) Discuss the structure of $[HNi(PPh_3)_4]^+$ by ^1H nmr.

Or

(b) Sketch and explain the significance of ESR spectrum of bis(salicylaldimine)copper(II).

15. (a) Write a note on Adamson's rules.

Or

(b) Explain the photochemical conversion of N_2 to NH_3.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain Perutz mechanism of dioxygen binding of haemoglobin.

Or

(b) Write a note on cyclic and non cyclic photo phosphorylation.

17. (a) Write a note on :

(i) structure and dioxygen binding of hemocyanin

(ii) structure and functions of carbonic anhydrase.

Or

(b) Explain inhibition and poisoning of xanthine oxidase and aldehyde dehydrogenases.

18. (a) Write a note on Mossbauer spectrum of hemerythrin and Fe_2S_2 clusters.

Or

(b) Explain the Mossbauer spectrum of Sn(II) and Sn(IV) compounds.

19. (a) Write a note on :

(i) the study of exchange reactions of N,N-dimethyl acetamide by ^1H nmr

(ii) HPF_2 under different conditions of J values.

Or

(b) (i) Find the g value of a metal ion having the ground state $^3F_2$.

(ii) Sketch and explain the ESR spectrum of $[Cu(bpy)_3]^{2+}$ and $[VO(H_2O)_6]^{2+}$.

20. (a) Explain the photochemistry at semiconductor electrodes.

Or

(b) Write a note on photochemical conversion and storage of solar energy.

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