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Reg. No. :

Code No. : 5423

Sub. Code : ZCHM 42

M.Sc.(CBCS) DEGREE EXAMINATION, APRIL 2023.

Fourth Semester

Chemistry – Core

BIO INORGANIC, SPECTRAL METHODS – II AND
PHOTOCHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following enzyme oxygenate the substrate?
- (a) Cytochrome P450
(b) Super Oxidase Dismutase
(c) Peroxidase
(d) Catalase

7. The proton nmr of HD molecule gives _____

- (a) three lines with equal intensity
(b) two lines with equal intensity
(c) two lines with 1:2 intensity
(d) three lines with 1:2:1 intensity

8. A metal with effective spin of S gives _____ number of ESR transitions.

- (a) S (b) 2S
(c) 3S (d) 4S

9. The radiative transition ${}^2E \rightarrow {}^4A_2$ 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) Photo isomerisation
(d) Oxidative quenching

2. In deoxy haemoglobin the co-ordination number of Iron is _____

- (a) 6 (b) 5
(c) 3 (d) 4

3. The enzyme carboxy peptidase is _____ shaped.

- (a) sickle (b) olive leaf
(c) egg (d) dumb bell

4. The number of molybdenum atoms in xanthine oxidase is

- (a) 3 (b) 4
(c) 1 (d) 2

5. The Mossbauer Spectrum of deoxy hemerythrin exhibits as

- (a) a doublet (b) two doublets
(c) quintet (d) triplet

6. Quadrupole splitting is seen for _____ ion.

- (a) high spin Fe(III) (b) low spin Fe(II)
(c) high spin Fe(II) (d) both (a) and (b)

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PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Discuss the structure and dioxygen bonding of hemerythrin.

Or

- (b) Write a note on in vivo nitrogen fixation.

12. (a) Explain the structure and reactions of SOD.

Or

- (b) Discuss the structure and catalytic activity of carbonic anhydrase.

13. (a) Elucidate the structure of $Fe_3(CO)_{12}$ by Mossbauer spectroscopy:

Or

- (b) Distinguish the Mossbauer spectrum of $K_4[Fe(CN)_6]$ and $K_3[Fe(CN)_6]$.

14. (a) Sketch and explain the ${}^{31}P$ nmr of HPF_2 different conditions of J_{P-F} and J_{P-H} .

Or

- (b) Sketch and explain the ESR spectrum of high spin Co(II) and Ni(II).

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

Or

(b) Describe types different of photo physical processes by using the energy level diagram of Cr(III).

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Write a note on electron transport sequence in photosynthesis.

Or

(b) Describe the structure and functions of Vitamin-B₁₂.

17. (a) Write a note on (i) structure and dioxygen binding of hemocyanin (ii) structure and functions of carboxy peptidase.

Or

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

18. (a) Write a note on Mossbauer spectrum of Rubredoxin and Ferredoxin [2Fe-2S]⁺.

Or

(b) Sketch and explain the Mossbauer spectrum of (i) FeSO₄·7H₂O (ii) Na[Fe(CN)₅NO] (iii) Fe(CO)₅.

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19. (a) Explain fluxional behaviour by NMR and ³¹P nmr of P₄S₃.

Or

(b) (i) Write a note on hyperfine splitting
(ii) EPR of bis(salicylaldimine)copper(II).

20. (a) Give a brief account on the role of [Ru(bpy)₃]⁺² as a photosensitizer in photo reduction and photo oxidation of H₂O.

Or

(b) (i) Describe the photochemical conversion of N₂ to NH₃.

(ii) Give a brief account on different types of photochemical processes.

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