

(6 pages)

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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

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)

Page 2

Code No. : 5423





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

Page 3

Code No. : 5423

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).

Page 4

Code No. : 5423

[P.T.O.]





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-B<sub>12</sub>.

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]<sup>+</sup>.

Or

- (b) Sketch and explain the Mossbauer spectrum of (i) FeSO<sub>4</sub>.7H<sub>2</sub>O (ii) Na[Fe(CN)<sub>5</sub>NO] (iii) Fe(CO)<sub>5</sub>.

Page 5

Code No. : 5423

19. (a) Explain fluxional behaviour by NMR and <sup>31</sup>P nmr of P<sub>4</sub>S<sub>3</sub>.

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)<sub>3</sub>]<sup>+2</sup> as a photosensitizer in photo reduction and photo oxidation of H<sub>2</sub>O.

Or

- (b) (i) Describe the photochemical conversion of N<sub>2</sub> to NH<sub>3</sub>.  
(ii) Give a brief account on different types of photochemical processes.

Page 6

Code No. : 5423

