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M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fourth Semester

Chemistry – Core

BIO INORGANIC, SPECTRAL METHODS – II
AND PHOTO CHEMISTRY

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

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. What is physiological role of ferritin?
(a) Iron storage
(b) Iron transport
(c) Enzyme action
(d) Electron transfer

2. Vitamin B₁₂ is a _____ complex
(a) Fe (b) Mg
(c) Ni (d) Cobalt
3. Stella cyanin plastocyanin and azurin are called _____ proteins
(a) Blue copper (b) Green copper
(c) White (d) Yellow copper
4. _____ is a enzyme molecule of it can decompose 26,40,000 molecules of H₂O₂ perminute at 0°C
(a) Oxygenase (b) Peroxidase
(c) Zinc enzyme (d) Catalase
5. The electrons which contribute to isomer shift in Mossbauer spectroscopy are _____
(a) S electrons (b) P electrons
(c) d- electrons (d) f electrons
6. The Mossbauer spectra of K₄[Fe(CN)₆] and K₃[Fe(CN)₅No] consists of respectively
(a) One line each (b) 2 lines each
(c) 1 and 2 lines (d) 2 and 5 lines

7. Which of the following electro magnetic radiation is used in ESR?
- (a) IR radiation (b) Radio waves
(c) X-radiation (d) Microwaves
8. EPR spectra of $[\text{CoF}_6]^{4-}$ complex shows _____ lines
- (a) 56 lines (b) 55 lines
(c) 58 lines (d) 59 lines
9. Photo chemical changes occur in the region of _____
- (a) 1000-600 nm (b) 800-200 nm
(c) 400-200 nm (d) 1200-400 nm
10. In _____ reactions molecules absorbing light do not themselves react but induce other molecules to react
- (a) Photosensitized
(b) Dark
(c) Thermal
(d) Irreversible

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on the following :
- (i) in vivo nitrogen fixation
(ii) in vitro nitrogen fixation.
- Or
- (b) Write down the biological function, toxicity and deficiency of any three trace elements.
12. (a) Write short notes blue copper proteins.
- Or
- (b) Give an account on metal complexes as probes of nucleic acids.
13. (a) Explain the Mossbauer spectroscopy of Tin compounds.
- Or
- (b) Write short notes on isomer shift.

14. (a) Write short notes on Zero field splitting and Kramer's degeneracy.

Or

- (b) Predict and explain the number of signals in the EPR spectra of the bis (salicylaldehyde) copper II complex.

15. (a) Explain the photo chemistry of C-(III) complexes.

Or

- (b) Write a short note on TiO_2 as a green photo catalyst in removing air and water pollutant.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Draw the structure of Haemoglobin and explain its structural features of Haemoglobin.

Or

- (b) Discuss the important structural features of vitamin B₁₂.

17. (a) Discuss in detail about superoxide dismutase.

Or

- (b) With suitable example, discuss the metal complexes as anticancer agents.

18. (a) Write a short note on the following.

- (i) Quadrupole splitting
(ii) Magnetic hyperfine splitting.

Or

- (b) Explain the Mossbauer spectra of the following compounds.

- (i) $\text{K}_4[\text{Fe}(\text{CN})_6]$
(ii) $\text{K}_3[\text{Fe}(\text{CN})_6]$.

19. (a) Discuss the number of signals and multiplicity of the ^{19}F and ^1H , ^{31}P NMR spectra of the following compounds.

- (i) NF_3
(ii) $[\text{HNi}(\text{PPh}_3)_4]^+$
(iii) P_4S_3
(iv) H_3PO_3 .

Or

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(b) Discuss the EPR spectra of the following complexes.

(i) $\text{Co}_3(\text{CO})_9\text{Se}$

(ii) $\text{Co}_3(\text{CO})_9\text{Rh}$.

20. (a) Discuss the photo physical and photo chemical properties of $[\text{Ru}(\text{bpy})_3]^{2+}$ complex.

Or

(b) Discuss in detail about photochemical conversion and storage of solar energy.
