ST JOSEPH'S UNIVERSITY, BENGALURU-27
M.Sc. Analytical Chemistry – III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November/ December 2023)
CH 9123: Biological Chemistry
(For current batch students only)

Time: 2 Hours   Max Marks: 50

This question paper contains **TWO** printed pages and **THREE** parts

PART-A

Answer any EIGHT of the following: 8 X 2 = 16

1. What is specific acid-base catalysis?
2. Name and draw the structure of a coenzyme that contains an adenine molecule.
3. Give an example of a reaction involving the coenzyme lipoic acid.
4. Mention the role of troponin and tropomyosin in muscle contraction?
5. What is meant by binding affinity? Give its significance.
6. Differentiate between active and passive transport.
7. Mention any two structural features of iron-sulphur protein.
8. What is SOD? What are the metal ions involved in SOD?
9. Draw the structure of two platinum-based anticancer drugs.
10. Define nitrogen fixation and give its importance.

PART B

Answer any TWO of the following: 2 X 12 = 24

11. Explain the mechanism of action of the following enzymes (i) carbonic anhydrase
    (ii) catalase (iii) liver alcohol dehydrogenase.

12. (a) Give a schematic diagram of the active site of lysozyme.
    (b) Elucidate the mechanism by which pyridoxal – 5 ─ phosphate acts in the formation of a keto acid from an amino acid.
    (c) Explain with reactions the initiation stage of protein synthesis.   (3+5+4)

13. (a) Explain any one biological role of NO.
    (b) Discuss the structural features and functions of Rubredoxin.

(c) Derive the Michaelis-Menton equation for simple steady state kinetics.   (3+3+6)

PART C

Answer any TWO of the following: **2 X 5 = 10**

14. (a) In the conversion of A into D in the following biochemical pathway, enzymes EA, EB, and EC have the K_m values indicated under each enzyme. If all of the substrates and products are present at a concentration of 10^{-4} M, which step will be rate determining and why?

$$A \rightleftharpoons^{E_A} B \rightleftharpoons^{E_B} C \rightleftharpoons^{E_C} D$$
$$K_M = \quad 10^{-2}\,M \qquad 10^{-4}\,M \qquad 10^{-4}\,M$$
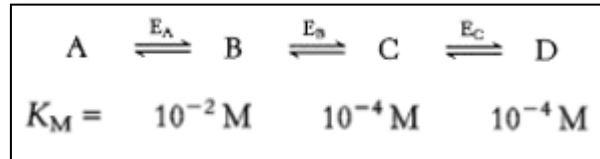
(b) V_{max} and k_m for an enzyme catalyzed reaction are 2.0 x10^{-3} ms^{-1} and 1.0 x 10^{-6} M respectively. Calculate the rate of the reaction when [S] = 1.0 x 10^{-6} M.   (2+3)

15. (a) Cu deficiency causes anemia. Explain
(b) In hemoglobin, oxygen is coordinated with the heme group which is protected inside a globin protein. Why does hemoglobin have this structural arrangement?   (2+3)

16. (a) Why Zn is the nature's choice in hydrolytic metalloenzymes instead of many other elements in the earth?
(b) If glycolysis and gluconeogenesis were to occur together, which would have been the preferred pathway and why?   (2+3)

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