Date:

Registration number:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27
M.Sc. Analytical Chemistry - III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2022
(Examination conducted in December 2022)
CH 9122 – BIOLOGICAL CHEMISTRY

Time- 2 ½ hrs **Max Marks-70**

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

Part A

Answer any SIX of the following questions. **[6 x 2 = 12]**

1. Why do living things require a continuous input of free energy?
2. Draw the oxidised and reduced forms of lipoic acid.
3. Differentiate between positive and negative cooperativity.
4. Give two examples of non-covalent interactions seen in biomolecules.
5. List any two sources of Hg toxicity.
6. Mention the basic requirements of a chelation antidote.
7. Justify the name carboxypeptidase A.
8. Differentiate between active and passive transport.

Part B

Answer any FOUR of the following questions. **[4 x 12 = 48]**

9. (a) Explain the structural feature of hemerythrin and hemocyanin and their role in oxygen transport?
   (b) What is nerve impulse? How is it created? (6+6)

10. (a) Discuss the structure and activity of catalase and peroxidase.
    (b) What is ascorbic acid oxidase. Discuss its structure and reactivity. (6+6)

11. (a) Valinomycin binds with K^+ more tightly than Na^+. Explain.
    (b) What is iron sulfur protein? Discuss the general structural feature of iron sulfur protein.
    (c) Compare the structure of haemoglobin and cytochrome. (4+4+4)

12. (a) Discuss the mechanism between chymotrypsin and the following polypeptide: Asp-Leu-Glu-Glu-His-Phe-Gly-Gly-Pro-Lys-His-Met. How many fragments are formed at the end of the reaction.
    (b) Give a suitable explanation for the large, negative free-energy change associated with ATP hydrolysis? (7+5)

13. (a) Explain the mechanism involved in the conversion of pyruvate to acetaldehyde, by a TPP dependent decarboxylase.
(b) Give the reactions involved in the first stage of cholesterol biosynthesis. Indicate the rate determining step. (6+6)

14.(a) Draw the structure of coenzyme A and give example of reaction it catalyses by functioning as a coenzyme.
(b) Explain how elongation of a peptide chain takes place after the initiation complex is formed. How is chain elongation terminated? (4+8)

Part C

Answer any TWO of the following questions. **[2 x 5 = 10]**

15.Heterolytic O – O bond cleavage is a common step in catalase and peroxidase, but not in haemoglobin. Explain.

16.(a) The chloride ion can regulate Na^+/K^+ ion concentration inside the cell. Explain.
(b) Are hydrophobic interactions one of the factors influencing protein conformations? Justify. (2+3)

17.(a) Which of the following enzymes has the largest catalytic efficiency and why?

ENZYME	K_m (M)	K_{cat} (s^{-1})
A	9.5×10^{-5}	1.4×10^{4}
B	2.5×10^{-2}	1.0×10^{7}

(b) You discover a new inhibitor to an enzyme, and its crystal structure clearly shows that it binds in the active site, at the same location as the substrate. Does this indicate the presence of competitive inhibition. How would you know if this inhibitor was competitive or not? (3+2)

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