



ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU - 27

B. Sc. – 6th SEMESTER

SEMESTER EXAMINATION: APRIL 2024

(Examination conducted in May /June 2024)

CH 6223: CHEMICAL BIOLOGY

(For current batch students only)

Registration Number:

Date & Session:

Time: 2 Hours

Max Marks: 60

This paper contains TWO printed pages and THREE parts.

PART-A

Answer any SEVEN of the following. Each question carries TWO marks. [7 x 2 = 14]

1. What is the significance of the property of water as a solvent in biological system?
2. What are blood group antigens? Which blood group is the universal donor?
3. Define iodine number. What does a low iodine number indicate?
4. How does α - amino acid react with ninhydrin?
5. Mention the prominent features of active site of an enzyme.
6. Give a reaction that illustrates substrate level phosphorylation.
7. Distinguish between anabolism and catabolism.
8. Give any two general characteristics of genetic code.
9. Mention any two applications of bioinformatics.

Part B

Answer any SIX of the following. Each question carries SIX marks. [6 x 6 = 36]

10. a) What is sephadex? List its applications.
b) Give an example for each of the following: **(3 + 3)**
(i) Transport protein (ii) Structural protein (iii) Storage protein
11. a) Draw a structure of phosphatidylserine. Mention its biological significance.
b) With a suitable example, discuss the application of liposomes in drug delivery systems. **(3 + 3)**
12. How are enzymes classified? Give an example for each class.
13. a) Draw the structure of ATP. Why is it called a high energy compound?
b) What is genomics and proteomics? **(3 + 3)**
14. Give the reactions for the β -oxidation of stearic acid (C18). Calculate the total number of ATP produced by the complete oxidation of stearic acid.

15. a) Give the reactions along with the required coenzymes/cofactors, catalyzed by the following enzymes of glycolytic pathway. (i) Phosphoglucosomerase (ii) Aldolase
 b) Explain the transamination and decarboxylation of amino acids with an example each. **(3 + 3)**
16. a) Differentiate B DNA from other forms of DNA.
 b) Draw the structure of the nucleotide present in RNA and not in DNA. **(3 + 3)**
17. a) With a neat labelled diagram, describe the formation of DNA replication fork.
 b) Explain how the initiation complex is formed during translation. **(3 + 3)**

Part C

Answer any TWO of the following. Each question carries FIVE marks. [2 x 5 = 10]

18. a) A heteropolysaccharide which is found in skin care products is also used to treat rheumatoid arthritis. Write the partial structure of this heteropolysaccharide.
 b) Arrive at the structure of tripeptide from the following observations given below. **(2 + 3)**
 (i) On complete hydrolysis give two moles of valine and one mole of cysteine.
 (ii) Partial hydrolysis results a dipeptide cysteinyl valine.
 (iii) Reaction with Sanger's reagent followed by hydrolysis gives 2,4-dinitrophenyl valine.
19. Enzyme X and Enzyme Y are both involved in monosaccharide metabolism. Enzyme X uses glucose as a substrate while Enzyme Y uses fructose as a substrate. At pH=7.0, Enzyme X has a V_{max} of 10 $\mu\text{M/s}$ while Enzyme Y has a V_{max} of 20 $\mu\text{M/s}$. Both enzymes have a K_m of 3.0 mM for their respective substrates.
 (i) An inhibitor galactose binds to enzyme X at a site other than the active site. Identify the type of inhibition. What will happen to the values of K_m and V_{max} of the reaction in the presence of galactose?
 (ii) Enzyme Y can use the monosaccharide ribose also as a substrate with a K_m of 8.0 mM. Which substrate would have a better affinity to enzyme Y and why?
20. What is the standard free energy change under physiological conditions for the following reaction?

$$\text{Glucose-6-phosphate} \rightleftharpoons \text{Fructose-6-phosphate}$$
 Given: $K_{eq} = 1.97$, $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$, at 37 °C. Comment on the spontaneity of the reaction.
