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Sr. No. of Question Paper : 6370

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Your Roll No.....

Unique Paper Code : 249301

Name of the Course : **B.Sc. (Hons.) / Bio-Chemistry**

Name of the Paper : Proteins and Enzymes (BCHT-304)

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt 5 questions in all.
3. Question No. 1 is compulsory.

1. (a) State whether true or false with justification.

- (i) Mutating Asp to Glu does not change the structure of a protein.
- (ii) Rotation around peptide bonds is restricted.
- (iii) Since cytochrome c and hemoglobin are both Fe containing proteins, they have the same tertiary structure.
- (iv) An enzyme reaches maximum rate at high substrate concentration because it has a fixed number of active sites where substrate binds.
- (v) Higher concentrations of enzyme give rise to a higher turnover number.
- (vi) Proline is a helix breaker.
- (vii) The rate of an enzyme-catalyzed reaction is a linear function of high substrate concentration. (7×2=14)

(b) Mention the contribution of the following scientists in the field of protein chemistry.

P.T.O.

- (i) Arieh Warshel
- (ii) Max Perutz
- (iii) Linus Pauling and Robert Corey
- (iv) Fredrick Sanger
- (v) Bruce Merrifield (5)

2. (a) Differentiate between the following pairs :

- (i) Denaturation and Renaturation
- (ii) Domain and Motif
- (iii) Metalloenzymes and Metal activated enzymes
- (iv) Primary and Secondary structure of proteins
- (v) Globular and Fibrous proteins
- (vi) Multienzyme complex and Multifunctional enzymes

(b) Write the products formed when the octapeptide AVGWRVKS is digested with trypsin. Which technique would be most appropriate for separating the products ? (12,2)

3. (a) Describe the following types of enzyme regulation citing an example in each case.

- (i) Feedback inhibition
- (ii) Covalent modification

(b) Determine the sequence of the heptapeptide based on the following observations :

- (i) Amino acid analysis of the heptapeptide revealed that the original peptide was composed of: R, V, Y, E, K, A and G.

- (ii) Reaction of the heptapeptide with dansyl-Cl and acid hydrolysis gave dansyl-A.
- (iii) Digestion of the heptapeptide with –
- (a) Carboxypeptidase gave G as the first detectable amino acid.
 - (b) Trypsin gave free R, a dipeptide (A-K) and a tetrapeptide containing E, G, Y and V. Digestion of the tetrapeptide further with chymotrypsin gave two dipeptides: V-Y and E-G.
 - (c) Pepsin gave a tetrapeptide and a tripeptide (Y-E-G). (8,6)
4. (a) Explain the following with suitable examples :
- (i) Competitive inhibition
 - (ii) Non-competitive inhibition
 - (iii) Suicide inhibition
- (b) How is hemoglobin suited to its physiological role ? (9,5)
5. (a) What are the important catalytic residues of the enzyme chymotrypsin. Explain its mechanism of action ?
- (b) What are bisubstrate reactions ? Explain single and double displacement reactions with suitable examples. (7,7)
6. (a) Identify the coenzymes utilized by the following enzymes, give their structure, reaction catalysed and mechanism of action.
- (i) Transaminase
 - (ii) Pyruvate Dehydrogenase
- (b) How do chaperones contribute in protein folding ? (10,4)
7. (a) Comment on the following experimental protocols :

- (i) In the purification of enzymes a small amount of a competitive inhibitor is added for stability.
 - (ii) Substrate analogs are used as ligands in affinity purification.
 - (iii) After ammonium sulphate fractionation, the fractions are subjected to dialysis before protein and enzyme assays are performed.
 - (iv) In studying the kinetics of sucrose phosphorylase, sucrose and a little amount of radioactive fructose is added.
- (b) Describe the Ramachandran Map and draw a plot for a polyglycine polypeptide. (8,6)

8. (a) Explain the following :-

- (i) An inhibitor of prolyl hydroxylase has been isolated from a plant. The addition of this compound to the diet of a rat results in fragile blood vessels, skin lesions and bleeding gums.
- (ii) Fetal hemoglobin has higher affinity for oxygen than adult hemoglobin.
- (iii) K_M is a good parameter for judging *in vivo* substrate concentrations.
- (iv) When a protein is shifted from a polar medium to 10% dioxane the fluorescence due to tryptophan residues increase.

(b) Write short notes on :

- (i) Structure of silk fibroin
- (ii) Zymogens
- (iii) Isozymes (8,6)