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S. No. of Question Paper : 8671

Unique Paper Code : 249301

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

Name of the Course : B.Sc. (H) Bio-Chemistry Part II

Semester : III

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. 1 is compulsory.

Use of scientific calculator/log tables may be allowed.

1. (A) State **true** or **false** with justification :

- (a) Competitive inhibition is reversible.
- (b) Enzymes allow substrates to increase their activation energy to facilitate product formation.
- (c) Allosteric enzymes obey Michaelis-Menten kinetics at high substrate concentration.
- (d) K_{cat}/K_m is a measure of catalytic efficiency.
- (e) Fibrous proteins have only one type of secondary structure.

P.T.O.

(B). Give a suitable example for each of the following:

- (i) Metalloprotein
- (ii) Allosteric enzyme
- (iii) Biotin containing enzyme
- (iv) Multienzyme complex
- (v) Zymogen
- (vi) Only β -sheet containing protein
- (vii) Lyase
- (viii) Endopeptidase
- (ix) Isozyme
- (x) Non-proteinaceous enzyme.

(C) Give the contributions of the scientists :

- (i) Perutz;
- (ii) Anfinsen;
- (iii) Kuhne;
- (iv) Sumner.

(10,5,4)

2. Explain why :

- (i) Woollen clothing shrinks when washed in hot water, but items made of silk do not.
- (ii) Residues such as val, leu, ile, met and phe are often found in the interiors of the protein while arg, lys, asp and glu are found on the surface of the protein.
- (iii) Hb and Mb though of similar polypeptide structure show enormous difference in their oxygen binding curves.
- (iv) Proline is considered a helix breaker but the collagen triple helix has 60% hydroxy proline.
- (v) Reactions catalysed by dehydrogenases are usually bisubstrate.
- (vi) The formation of trypsin by enteropeptidase is a master activation step *in situ*.
- (vii) Suicide inhibitors are used as therapeutics. (7×2)

3. (A) Differentiate between :

- (i) Globular and fibrous protein
- (ii) Denaturation and Renaturation
- (iii) Apoenzyme and holoenzyme
- (iv) Positive and negative modulator
- (v) Cofactor and coenzyme

(B) Illustrate covalent catalysis with a suitable enzyme example. (10,4)

P.T.O.

4. (A) Identify the coenzymes utilized by these enzymes, give their structure, reaction catalysed and the vitamin precursors :

(i) Transaminase

(ii) Succinate dehydrogenase

(iii) Malate dehydrogenase

(iv) Pyruvate decarboxylase

(v) Tetrahydrofolate reductase

(B) What are metalloenzymes and metal activated enzymes? Explain the catalytic role of each with suitable examples. (10,4)

5. (A) Determine the sequence of a peptide consisting of 14 amino acids on the basis of the following data :

Amino acid composition : (4S, 2L, F, G, I, K, M, T, W, Y)

N-terminal analysis : S

Carboxypeptide digestion : L

Trypsin digestion : (3S, 2L, F, M, T, W) (G, K, S, Y)

Chymotrypsin digestion : (F, I, S) (G,K,L) (L,S) (M,T) (S,W) (S,Y)

N-terminal analysis of (F,I,S) peptide : S

Cyanogen Bromide treatment : (2S,F,G,I,K,L,M*,T,Y) (2S,L,W)

M*, methionine detected as homoserine

- (B) 2,3- BPG enables hemoglobin to unload oxygen in tissue capillaries by lowering the oxygen affinity of haemoglobin. Explain the mechanism
- (C) Explain why N-terminal sequencing is preferred to C-terminal methods. (6,4,4)
6. (A) Differentiate kinetically between competitive and mixed inhibition. Explain why *in vivo* inhibitions are mainly of the mixed type.
- (B) While inspecting V_o vs $[S]$ data for an uninhibited enzyme can you determine its K_m ? Also determine the K_i for a competitively inhibited enzyme wherein $K_m = 0.5\text{mM}$ and $K_m' = 1.5\text{mM}$ and $[I] = 2\text{mM}$.
- (C) Velocity of a reaction catalyzed by μg of enzyme of molecular weight 30,666 is equal to 0.166 $\mu\text{mole}/\text{min}$. Calculate the turn over number. (7,4,3)
7. (A) What are bisubstrate reactions ? How can you distinguish the various categories of these reactions kinetically ? Give suitable examples.
- (B) Explain, why multienzyme complexes are efficient. (10,4)

P.T.O.

8. Write short notes on any *two* :

(a) Mechanisms of enzyme action

(b) Allosteric enzymes

(c) Isoenzymes.

7,7