T (II)-Biochemistry-H-3(Mod.-VI)

2×10

2021

BIOCHEMISTRY — HONOURS

Third Paper

(Module - VI)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer question no. 1 and any three questions taking one each from Unit-I, Unit-II and Unit-III.

1. Answer *any ten* questions :

- (a) Differentiate between biocatalyst and chemical catalyst.
- (b) What is the role of vitamin K in blood clotting?
- (c) Define specific activity of an enzyme. What is its unit?
- (d) Write the name of the enzyme that has been used traditionally (i) on the production of cheese (ii) to tenderize the meat.
- (e) What are isozymes? Give examples.
- (f) Define allosteric modulator with example.
- (g) Define turnover number. What is its unit?
- (h) Define the terms entropy and enthalpy.
- (i) What is salting out?
- (j) Name two enzymes requiring iron for their activity.
- (k) Define prosthetic group with an example.
- (l) What is feedback inhibition?

Unit-I

- 2. (a) Explain why very tight binding of a substrate to an enzyme is not desirable for enzyme catalysis, whereas tight binding of the transition state is desirable.
 - (b) What is ping-pong reaction? Explain with example.

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- (c) Consider an enzyme with a Michaelis-Menten mechanism a K_M of 0.1 mM and a V_{max} of 0.01 mM/sec. Answer the following :
 - (i) At what substrate concentration would the enzyme have an initial velocity of 1 micromole/sec?
 - (ii) What fraction of the enzyme would be in the enzyme substrate complex if the initial velocity is 8 micromole/sec?
 3+3+(2+2)
- 3. (a) Explain the significance of K_M and V_{max} .
 - (b) The quantity of Kcat/Km is a measure of an enzyme's catalytic efficiency. Explain.
 - (c) Activation energy of enzyme catalysed reaction differs from non-enzyme catalysed reaction. Explain.
 - (d) Compare lock and key hypothesis and induced fit hypothesis. 3+2+2+3

Unit-II

- 4. (a) Discuss sequential model of allosterism. Define allosteric modulators with example.
 - (b) Differentiate between competitive and uncompetitive enzyme inhibition in terms of Michaelis-Menten equation and Lineweaver-Burk plot.
 - (c) What are M enzymes? Cite one example. (3+2)+3+2
- 5. (a) An enzyme has a K_M of 4.7×10^{-5} M. If V_{max} of the preparation is 22 micromoles/lit/min, what velocity would be observed in presence of 2×10^{-4} M substrate and 5×10^{-4} M of competitive inhibitor? ($K_i = 3 \times 10^{-4}$ M).
 - (b) Describe the shapes of 1/V vs. 1/S curves for enzymes showing (i) +ve cooperativity (ii) -ve cooperativity of binding of the substrate.

(2+2)+(2+2)+2

(c) What is the significance of zymogens?

Unit-III

- 6. (a) Describe principle of Ion Exchange Chromatography.
 - (b) Differentiate between Adsorption chromatography and Affinity chromatography.
 - (c) Name two proteases used in detergent industry. What should be the characteristics of those proteases?
 3+3+(2+2)
- (a) When 10 microgram of an enzyme of molecular weight 50,000 is added to a solution containing a substrate at a concentration of 100 time K_m, it catalyses conversion of 75 micromoles of substrate into product in 3 minutes. Calculate turnover number of the enzyme.
 - (b) From a mixture of Lys (pI = 9.47), Asp (pI = 2.98) and His (pI = 7.64), how can you retrieve individual amino acids?

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- (c) In what order do the following proteins emerge upon gel filtration column?
 - (i) Galactosidase (120 K Da)
 - (ii) Carbonic anhydrase (30 K Da)
 - (iii) Lysozyme (14 K Da)
 - (iv) Ovalbumin (40 K Da)

Justify your answer.

3+3+(2+2)