ADVANCED ENZYME TECHNOLOGY
(BIOT 5131)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Transferase belong to E.C group of
(a) 1 (b) 2 (c) 5 (d) 3

(ii) Increasing the pH of the protein beyond PI, makes the protein
(a) cation (b) anion (c) zwitterion (d) none of the above.

(iii) The component of affinity chromatography which enhances the binding of stationary phase with the target molecule by overcoming the stearic hindrances is known as
(a) ligand (b) analyte (c) matrix (d) spacer arm.

(iv) Rf value in a thin layer chromatography is always
(a) Less than 1 (b) Less than 0
(c) More than 1 (d) None of the above.

(v) The ratio of the molar concentration in the stationary phase to the molar concentration in the mobile phase is known as
(a) partition coefficient (b) retention factor
(c) selectivity coefficient (d) phase ratio

(vi) Recombinant lipase is used in
(a) leather Industry (b) detergent Industry
(c) baking Industry (d) all of these.

(vii) Acrylamide formation is inhibited in presence of
(a) DNase (b) Urate oxidase
(c) Lactase (d) Asparaginase.

(viii) Desizing is used in
(a) Leather Industry (b) Baking Industry
(c) Textile Industry (d) None of these.

(ix) Lignin mainly consist of
(a) aromatic alcohol (b) aliphatic alcohol
(c) aromatic hydrocarbon (d) none of these.

(x) A calorimetric biosensor uses this to measure the heat change
(a) thermometer (b) thermocoupler
(c) thermistor (d) all of these.

Fill in the blanks with the correct word

(xi) A _____ refers to a catalytically active enzyme that consists of both apoenzyme and cofactor.

(xii) The series of the peaks obtained from the detector of a chromatograph is known as _____.

(xiii) Salting out is described by _____ theory.

(xiv) A biosensor to be used for invasive monitoring in clinical solutions, the probe must be _____ and _____.

(xv) Enzyme that can be used to treat skin ulcer is _____.

Group - B

2. (a) Illustrate the working principle of oxido-reductase. *[(CO1)(Illustrate/IOCQ)]*
(b) Give a brief outline of the mechanism of enzyme action. *[(CO1)(Remember/LOCQ)]*
(c) Analyze the technique of breaking cells by High pressure homogenizer. *[(CO2)(Analyze/HOCQ)]*

4 + 4 + 4 = 12

3. (a) Examine the working principle of centrifuge filtration to separate proteins from the cell debris. *[(CO2)(Examine/IOCQ)]*
(b) Comment on the advantages of microbial enzymes. *[(CO1)(Comment/LOCQ)]*
(c) Illustrate the role of different types of inhibitors on enzyme activity. *[(CO1)(Illustrate/IOCQ)]*

4 + 4 + 4 = 12

Group - C

4. (a) Design Hollow fibre reactor as Immobilized Enzyme Bioreactor. *[(CO3)(Design/IOCQ)]*
(b) Explain how the enzymes can be immobilized by entrapment method. *[(CO3)(Explain/IOCQ)]*
(c) What do you mean by Selectivity factor in a chromatography? *[(CO3)(Remember/LOCQ)]*

5 + 5 + 2 = 12

5. (a) Explain how a His- tagged protein can be purified in an affinity chromatography *[(CO3)(Explain/HOCQ)]*
(b) Enumerate with an example the working principle of a Cation exchange chromatography. *[(CO3)(Enumerate/IOCQ)]*

(c) Comment on Iso-electric point precipitation of protein. *[(CO3)(Remember/LOCQ)]*

5 + 4 + 3 = 12

Group - D

6. (a) Mention application of enzymes in paper industry. *[(CO3)(Analyse/HOCQ)]*
   (b) Analyse different merits and demerits of penicillin production. *[(CO4)(Remember/LOCQ)]*
   (c) Write the name of any one recombinant lipase and its application. *[(CO3)(Apply/IOCQ)]*

4 + 6 + 2 = 12

7. (a) Explain how carcinogenic compound formation is inhibited in baking industry. *[(CO3)(Analyse/HOCQ)]*
   (b) Illustrate different steps involved in complete hydrolysis of cellulose. *[(CO4) (Illustrate/IOCQ)]*
   (c) Mention the mode of action of raffinase. *[(CO4)(Apply/IOCQ)]*

4 + 6 + 2 = 12

Group - E

8. (a) Describe with a labelled diagram the different components of a biosensor that detects change in heat during a biochemical reaction. *[(CO5)(Describe/IOCQ)]*
   (b) What qualities a successful biosensor must possess? *[(CO5) (Remember/IOCQ)]*
   (c) In which type of biosensor a semipermeable membrane is used and how? *[(CO5)(Apply/HOCQ)]*

4 + 4 +4 = 12

9. (a) Mention the role of asparaginase in treating cancer. How the immunogenic response is avoided in this case? What other enzymes can be used for treating different types of cancer? *[(CO6)(Analyse/HOCQ)]*
   (b) What are synzymes? What advantage it possess over enzymes? *[(CO6)(Remember/LOCQ)]*

(1 + 6)+ (2 + 3) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	25	45.83	29.17

Course Outcome (CO):

After completing this course, students will be able to:

1. Students will be able to describe the mechanism of enzyme actions.
2. Students will be able to design general protocol for processing of enzymes from different sources.
3. Students will be able to describe different methods for purification and immobilization of enzymes.
4. Students will be able to apply enzymes in various industries that can benefit human life.
5. Students will be able to develop various enzyme biosensors for therapeutic purposes.
6. Students will be able to interpret future prospects of Enzyme Technology.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*