

**ADVANCED ENZYME TECHNOLOGY  
(BIOT 5131)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) If the solvent is forced down the column by positive air pressure, it is called  
(a) Gravity chromatography (b) Gradient chromatography  
(c) Isocratic chromatography (d) Flash chromatography.
- (ii) Subtilisin is  
(a) Protease (b) Lipase (c) Amylase (d) None of these.
- (iii) Xylanase enzyme is mainly used in  
(a) paper industry (b) textile industry  
(c) brewing industry (d) none of these.
- (iv) Biopulping occurs mainly in  
(a) paper industry (b) textile industry  
(c) brewing industry (d) none of these.
- (v) DE value determination is required for  
(a) Starch hydrolysis (b) Lipid hydrolysis  
(c) Pectin hydrolysis (d) None of these.
- (vi) In which immobilization technique, cyanogen bromide activation is done?  
(a) Adsorption (b) Covalent Binding  
(c) Entrapment (d) Cross-linking.
- (vii) The design of which reactor does not allow for control of pH by addition of acids or bases  
(a) CSTR (b) Packed Bed Reactor  
(c) Bubble column reactor (d) All of the above.
- (viii) In gel chromatography, if  $V_g$  = Volume of the beads,  $V_i$  = Volume of the pores,  $V_o$  = Void Volume and  $V_t$  = Total Volume, then  
(a)  $V_t = V_g + V_i - V_o$  (b)  $V_t = V_g + V_i + V_o$   
(c)  $V_g = V_t + V_i + V_o$  (d)  $V_t = V_g - V_i - V_o$

- (ix) The enzyme used to treat Leukaemia is  
(a) Asparaginase (b) Glutaminase  
(c) Either of (a) or (b) (d) Both (a) and (b).
- (x) 1 U of Enzyme is equal to  
(a) 16.67 nano katal of enzyme (b) 67.16 nano katal of enzyme  
(c) 30.16 nano katal of enzyme (d) None of these.

### Group- B

2. (a) Illustrate the working principle of separating the enzymes from the cell debris by Rotary vacuum filtration. [(CO1)(Illustrate/IOCQ)]  
(b) Differentiate enzymes from chemical catalyst. [(CO1)(Differentiate/IOCQ)]  
(c) Comment on Isomerases. [(CO1)(Understand/LOCQ)]  
**5 + 4 + 3 = 12**
3. (a) Analyze the technique of breaking cells by ultrasonic cell disruption? [(CO2)(Analyze/HOCQ)]  
(b) Comment on the factors on which the sedimentation velocity of a particle depends. [(CO2)(Comment/IOCQ)]  
(c) Distinguish between a cross flow filtration and a dead end filtration. [(CO2)(Distinguish/IOCQ)]  
**5 + 4 + 3 = 12**

### Group - C

4. (a) State the characteristics of an ideal adsorbent. [(CO3)(Understand/LOCQ)]  
(b) Design CSTR as Immobilized Enzyme Bioreactor. [(CO3)(Design/HOCQ)]  
(c) Comment on the advantages of Enzyme Immobilization. [(CO3)(Comment/LOCQ)]  
**4 + 6 + 2 = 12**
5. (a) Explain how a GST tagged protein can be purified in an affinity chromatography. [(CO3)(Explain/IOCQ)]  
(b) Design Bubble Column Reactor as Immobilized Enzyme Bioreactor. [(CO3)(Design/HOCQ)]  
(c) State the components of the affinity chromatography. [(CO3)(Understand/LOCQ)]  
**5 + 5 + 2 = 12**

### Group - D

6. (a) Mention different enzymes used in leather industry. [(CO4)(Remember/LOCQ)]  
(b) Differentiate between liquefying and saccharifying amylase. [(CO4)(Compare/HOCQ)]  
(c) What is lipolase? [(CO4)(Analyze/IOCQ)]  
**5 + 5 + 2 = 12**
7. (a) Enumerate the function of glucoamylase in baking industry? [(CO3)(Enumerate/IOCQ)]

- (b) What is HFCS and how it is prepared? [(C05)(Understand/LOCQ)]  
 (c) What is chill hazing? [(C04)(Analyze/IOCQ)]  
**4 + 4 + 4 = 12**

**Group - E**

8. (a) What are biosensors? Illustrate with a schematic diagram the different parts of a biosensor. [(C06)(Understand, Illustrate, LOCQ, IOCQ,)]  
 (b) Analyse by a schematic diagram the working principle of a calorimetric biosensor. [(C05)(Analyze/IOCQ)]  
**(2 + 4) + 6 = 12**
9. (a) Define artificial enzyme. [(C05)(Define/LOCQ)]  
 (b) How enzymes can be used in the treatment of cancer? [(C05)(Understand/IOCQ)]  
 (c) What are synzymes and biochips? Explain with example. [(C05)(Explain/IOCQ)]  
**2 + 5 + 5 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	29.16	48.95	21.87

**Course Outcome (CO):**

After completion of this course, the students should 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

