

M.TECH. DEGREE EXAMINATIONS: JANUARY 2011

First Semester

BIOTECHNOLOGY

BTY551: Enzyme Technology and Applications

Time: Three hours

Maximum Marks: 100

Answer All Questions:-

PART A (10 x 2 = 20 Marks)

1. Define specific activity.
2. What are the advantages of Lineweaver-Burk plot over Michaelis-Menten plot?
3. What is Damkohler number? What does it indicate?
4. Define effectiveness factor.
5. What is salting-out in ammonium sulfate precipitation?
6. How is isoelectric point useful in the purification of proteins?
7. Name any four enzymes used in food industries.
8. What are abzymes?
9. Classify biosensors
10. Write note on the environmental applications of biosensors.

PART B (5 x 16 = 80 Marks)

11. (a) (i) Derive the Michaelis-Menten equation for enzyme-catalyzed reactions. (12)
(ii) Why do we obtain bell-shaped curve while studying the effect of pH and temperature on enzyme activity? (4)
(OR)
(b) (i) Compare and contrast competitive inhibitors with un-competitive inhibitors (8)
(ii) Write a brief account on multiple-substrate enzymatic reactions (8)
12. (a) (i) What are the different mass transfer resistance steps observed for immobilized enzyme-catalyzed reactions? (8)
(ii) How are effectiveness factors calculated? (8)
(OR)
(b) (i) List out the advantages and disadvantages of immobilized enzymes (6)
(ii) The following data was recorded on studies on hydrolysis of sucrose at pH=4.5 and 30°C using invertase from *S. cerevisiae* in free and immobilized form. The

following initial velocity data were obtained with 408 units of crude enzyme (1 unit = quantity of enzyme hydrolyzing 1 μ mol of sucrose/min when incubated with 0.29M sucrose in a buffer at pH 4.5 and 30°C). (10)

V ₀ (mmol hydrolyzed/l-min)		
Free	immobilized enzyme	S ₀ (Mol/l)
0.083	0.056	0.010
0.143	0.098	0.020
0.188	0.127	0.030
0.222	0.149	0.040
0.250	0.168	0.050
0.330	0.227	0.100
0.408	0.290	0.290

13. (a) (i) Write the principle, methodology and applications of gel-filtration chromatography (8)

(ii) How are xylanases and proteases detected in zymogram? (6)

(OR)

(b) (i) Give an account on ammonium sulfate and solvent precipitation methods for the recovery of proteins from fermentation broth (8)

(ii) How is hydrophobic-interaction chromatography used to purify the proteins? (8)

14. (a) (i) Describe the applications of enzymes in pharmaceutical industries (6)

(ii) List out the enzymes and their applications for analytical and diagnostic applications. (10)

(OR)

(b) Give an account on the applications of lipase and pectinase with specific examples.

15. (a) (i) Write the principle of biosensor (4)

(ii) Write a note on different types of electrochemical biosensors (12)

(OR)

(b) Discuss in detail the applications of biosensors in healthcare and environment.
