B 409

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Fourth Semester

Industrial Biotechnology

IB 243 — ENZYME ENGINEERING AND TECHNOLOGY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Explain in brief about the concept of active site of enzyme and specificity of enzyme catalyzed reactions.

2. List the different classes of enzymes and briefly describe the role of each class.

3. Explain salting in and salting out process and its application in protein purification.

4. What is turn over number of enzyme? What does it indicates?

5. How do you assay an enzyme protein? Give suitable example.

6. Explain sequential and ping-pong bi substrate enzyme reactions with example.

7. What is Damkohler number? What does it indicates?

8. Describe the construction of enzyme electrode with suitable example.

9. Account on the use of enzymes in detergent industry.

10. Write briefly on production of penicillin in immobilized enzyme reactors.

PART B — (5 × 16 = 80 marks)

11. (i) Derive Michaelis – Menten equation for single substrate enzyme catalyzed reaction. How do you estimate K_m and V_{max}?

    (ii) Explain different types of enzyme regulation in the biological systems by giving suitable examples.

12. (a) (i) Explain different types of enzyme inhibition.

    (ii) The Hydrolysis of sucrose shows inhibition. Data for the hydrolysis of the reaction are given in table

Substrate concentration :	0.2 M		0.02 M	
	1/v	I	1/v	I
	0.22	0	0.68	0
	0.33	0.0012	1.02	0.0012
	0.51	0.0027	1.50	0.0022
	0.76	0.0044	1.83	0.0032
	0.88	0.0061	2.04	0.0037
	1.10	0.0080	2.72	0.0044
	1.15	0.0093	1.46	0.0059

Where v = moles/1/min and I is the inhibitor molar concentration.

(1) What type of inhibition reaction is this? Substantiate the answer.

(2) Based on the answer to part a, what is the value of K_I ?

Or

(b) Describe in detail the different steps involved in isolation, purification, and characterization of industrially important extracellular enzyme.

13. (a) (i) Explain the various methods of enzyme immobilization with their major advantage and disadvantage.

(ii) Outline the applications of immobilised enzymes with suitable examples.

Or

(b) (i) A batch containing the lactase is used to hydrolyse a 5% (w/v) solution of lactose (molecular weight 342) into a mixture of glucose and galactose. If the K_m and V_{max} of the enzyme used are 1mM and 600 μ mol/min/1 respectively, calculate the time required to achieve 80% conversion.

(ii) Derive the expression for the effectiveness factor for the enzymes immobilized in porous matrix.

14. (a) (i) Discuss the applications of enzymes in food and pharmaceutical industries.

(ii) Explain how enzymes are used for analytical and diagnostic applications.

Or

(b) How do you distinguish sequential and ping pong bi substrate reactions. Explain with suitable example.

15. (a) Employed by a biotechnology company, you have been given a task of developing biosensor for glucose in blood. Describe how you would set about your task. Include within your answer (i) the type or types of biosensor that you might investigate (ii) the mechanism for biosensor response (iii) likely advantage and disadvantage of analysis using your biosensor(s) relative to analysis by other methods.

Or

(b) (i) Describe in brief about the different types of reactors most commonly used for industrial enzyme reactions.

(ii) Mention the major advantage and disadvantage of each type of reactors.

(iii) Explain the productivity of each type of reactors.
