Code No: R05322302 **R05** **Set No. 2**

III B.Tech II Semester Examinations,December 2010
ENZYME ENGINEERING
Bio-Technology

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. An enzyme catalysed reaction of the form:
$AX + B \rightarrow BX + A$
was investigated at fixed pH, temperature and enzyme concentration at a series of fixed initial concentrations of B, the initial concentrations of AX being varied. The following were obtained:

Initial cocentration of AX (m mol. 1^{-1})	Initial velocity (μ mol 1^{-1} min^{-1}) of reaction where:		
	$[B_0]$=2.0 m mol. 1^{-1}	4.0 m mol. 1^{-1}	6.0 m mol. 1^{-1}
2.0	250	286	300
2.5	278	323	341
3.3	313	371	395
5.0	357	435	469
10.0	417	526	577

What can you deduce about the reaction mechanism? [16]

2. Derive mathematical expression for Thiele modulus for spherical and flat pellets and its significance in mass transfer operations. [16]

3. Discuss enzyme classification in terms of four-digit classification number? [16]

4. Write about simple classification of Enzyme immobilization techniques. [16]

5. The Purification table of purification process is as follows.

SNo	Procedure	Total protein (mg)	Activity(units)
i	Crude extract	20,000	4,000,000
II	Precipitation (salt)	5,000	3,000,000
iii	Precipitation (pH)	4,000	1,000,000
iv	Ion exchange chromatography	200	800,000
v	Affinity	50	750,000
vi	Size-exclusion	45	675,000

   (a) From the above table, calculate specific activity of the enzyme solution after each purification procedure.

   (b) Which of the purification procedures used for this enzyme is most effective (i.e., gives the greatest relative increase in purity)? Which one is least effective?

   (c) Is there any indication based on the results shown in the table that the enzyme after step 6, is no pure?

(d) What else could be done to estimate the purity of the enzyme? [4+4+4+4]

6. Write an essay on bienzyme electrode aystems with a suitable example. [16]

7. Derive a mathematical expression for the expected productivity of a batch reactor involving non-reversible Michaelis-Menten reaction without diffusional control,inhibition or denaturation. [16]

8. Discuss and compare the competitive and uncompetitive inhibition based on their kinetics. [16]

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Code No: R05322302 **R05** **Set No. 4**

III B.Tech II Semester Examinations,December 2010
ENZYME ENGINEERING
Bio-Technology

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Derive a mathematical expression for the expected productivity of a batch reactor involving non-reversible Michaelis-Menten reaction without diffusional control,inhibition or denaturation. [16]

2. An enzyme catalysed reaction of the form:
$AX + B \rightarrow BX + A$
was investigated at fixed pH, temperature and enzyme concentration at a series of fixed initial concentrations of B, the initial concentrations of AX being varied. The following were obtained:

Initial cocentration of AX (m mol. 1^{-1})	Initial velocity (μ mol 1^{-1} min^{-1}) of reaction where:		
	$[B_0]$=2.0 m mol. 1^{-1}	4.0 m mol. 1^{-1}	6.0 m mol. 1^{-1}
2.0	250	286	300
2.5	278	323	341
3.3	313	371	395
5.0	357	435	469
10.0	417	526	577

What can you deduce about the reaction mechanism? [16]

3. Discuss and compare the competitive and uncompetitive inhibition based on their kinetics. [16]

4. The Purification table of purification process is as follows.

SNo	Procedure	Total protein (mg)	Activity(units)
i	Crude extract	20,000	4,000,000
II	Precipitation (salt)	5,000	3,000,000
iii	Precipitation (pH)	4,000	1,000,000
iv	Ion exchange chromatography	200	800,000
v	Affinity	50	750,000
vi	Size-exclusion	45	675,000

   (a) From the above table, calculate specific activity of the enzyme solution after each purification procedure.

   (b) Which of the purification procedures used for this enzyme is most effective (i.e., gives the greatest relative increase in purity)? Which one is least effective?

   (c) Is there any indication based on the results shown in the table that the enzyme after step 6, is no pure?

(d) What else could be done to estimate the purity of the enzyme? [4+4+4+4]

5. Discuss enzyme classification in terms of four-digit classification number? [16]

6. Write about simple classification of Enzyme immobilization techniques. [16]

7. Derive mathematical expression for Thiele modulus for spherical and flat pellets and its significance in mass transfer operations. [16]

8. Write an essay on bienzyme electrode aystems with a suitable example. [16]

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Code No: R05322302 **R05** **Set No. 1**

III B.Tech II Semester Examinations,December 2010
ENZYME ENGINEERING
Bio-Technology

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Discuss and compare the competitive and uncompetitive inhibition based on their kinetics. [16]

2. Write an essay on bienzyme electrode aystems with a suitable example. [16]

3. Derive a mathematical expression for the expected productivity of a batch reactor involving non-reversible Michaelis-Menten reaction without diffusional control,inhibition or denaturation. [16]

4. Derive mathematical expression for Thiele modulus for spherical and flat pellets and its significance in mass transfer operations. [16]

5. An enzyme catalysed reaction of the form:
$AX + B \rightarrow BX + A$
was investigated at fixed pH, temperature and enzyme concentration at a series of fixed initial concentrations of B, the initial concentrations of AX being varied. The following were obtained:

Initial cocentration of AX (m mol. 1^{-1})	Initial velocity (μ mol 1^{-1} min $^{-1}$) of reaction where:		
	$[B_0]$=2.0 m mol. 1^{-1}	4.0 m mol. 1^{-1}	6.0 m mol. 1^{-1}
2.0	250	286	300
2.5	278	323	341
3.3	313	371	395
5.0	357	435	469
10.0	417	526	577

What can you deduce about the reaction mechanism? [16]

6. The Purification table of purification process is as follows.

SNo	Procedure	Total protein (mg)	Activity(units)
i	Crude extract	20,000	4,000,000
II	Precipitation (salt)	5,000	3,000,000
iii	Precipitation (pH)	4,000	1,000,000
iv	Ion exchange chromatography	200	800,000
v	Affinity	50	750,000
vi	Size-exclusion	45	675,000

   (a) From the above table, calculate specific activity of the enzyme solution after each purification procedure.

(b) Which of the purification procedures used for this enzyme is most effective (i.e., gives the greatest relative increase in purity)? Which one is least effective?

(c) Is there any indication based on the results shown in the table that the enzyme after step 6, is no pure?

(d) What else could be done to estimate the purity of the enzyme? [4+4+4+4]

7. Discuss enzyme classification in terms of four-digit classification number? [16]

8. Write about simple classification of Enzyme immobilization techniques. [16]

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Code No: R05322302 **R05** **Set No. 3**

III B.Tech II Semester Examinations,December 2010
ENZYME ENGINEERING
Bio-Technology

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. The Purification table of purification process is as follows.

SNo	Procedure	Total protein (mg)	Activity(units)
i	Crude extract	20,000	4,000,000
II	Precipitation (salt)	5,000	3,000,000
iii	Precipitation (pH)	4,000	1,000,000
iv	Ion exchange chromatography	200	800,000
v	Affinity	50	750,000
vi	Size-exclusion	45	675,000

   (a) From the above table, calculate specific activity of the enzyme solution after each purification procedure.

   (b) Which of the purification procedures used for this enzyme is most effective (i.e., gives the greatest relative increase in purity)? Which one is least effective?

   (c) Is there any indication based on the results shown in the table that the enzyme after step 6, is no pure?

   (d) What else could be done to estimate the purity of the enzyme? [4+4+4+4]

2. Write an essay on bienzyme electrode aystems with a suitable example. [16]

3. Derive mathematical expression for Thiele modulus for spherical and flat pellets and its significance in mass transfer operations. [16]

4. An enzyme catalysed reaction of the form:
   $AX + B \rightarrow BX + A$
   was investigated at fixed pH, temperature and enzyme concentration at a series of fixed initial concentrations of B, the initial concentrations of AX being varied. The following were obtained:

Initial cocentration of AX (m mol. 1^{-1})	Initial velocity (μ mol 1^{-1} min $^{-1}$) of reaction where:		
	$[B_0]$=2.0 m mol. 1^{-1}	4.0 m mol. 1^{-1}	6.0 m mol. 1^{-1}
2.0	250	286	300
2.5	278	323	341
3.3	313	371	395
5.0	357	435	469
10.0	417	526	577

   What can you deduce about the reaction mechanism? [16]

5. Discuss and compare the competitive and uncompetitive inhibition based on their kinetics. [16]

6. Write about simple classification of Enzyme immobilization techniques. [16]

7. Derive a mathematical expression for the expected productivity of a batch reactor involving non-reversible Michaelis-Menten reaction without diffusional control,inhibition or denaturation. [16]

8. Discuss enzyme classification in terms of four-digit classification number? [16]

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