http://www.howtoexam.com

THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY, PATIALA

(Department of Biotechnology and Environmental Sciences)

End semester examination (B.Tech Biotechnology IV year)

Course name : Reaction engg. & Enzyme technology | **Course no. :** BT 011

Course instructor: G. Vasundhara | **Date :** 05/12/06

Time : 3 hr | **Marks** : 36 marks

Attempt **any six** of the following questions:

1 a) What are the various microenvironmental factors affecting the rate of enzyme catalysed reactions? Explain the effect of pH and give the scheme to describe pH dependence of the enzymatic reaction rate for ionizing enzymes. **4.5**

b) What is the difference between integral and differential method of analysis of kinetic data? **1.5**

2 a) What are the various advantages offered by the biocatalytic transformations performed in organic media. **3.0**

b) A substrate is converted to a product by the catalytic action of an enzyme. Assume that the Michaelis-Menten kinetic parameters for this enzyme reaction are K_M = 0.03 mol/l r_{max} = 13 mol/l min. What should be the size of a steady-state CSTR to convert 95% of incoming substrate (C_{so} = 10 mol/l) with a flow rate of 10 l/hr? **3.0**

3 a) Derive the basic performance equation of a CSTR. What will be the performance expression for Ist order reaction with constant density systems. **4.0**

b) Consider a gas-phase reaction 2A = R + 2S with unknown kinetics. If a space velocity of 1/min is needed for 90% conversion of A in a plug flow reactor, find the corresponding space-time and mean residence time or holding time of fluid in the reactor. **2.0**

4 What are recycle reactors? Derive the performance equation for recycle reactors. When does the recycle system approach a mixed flow system. Give graphical representations. **6.0**

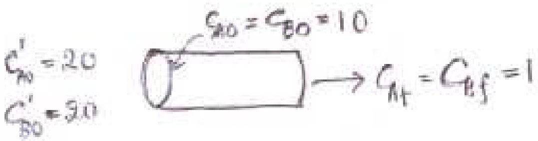
5 a) In the series reaction scheme in mixed flow reactor $A \xrightarrow{k_1} R \xrightarrow{k_2} S$, derive expressions for concentration of R and S. At what space time the C_R will be maximum? **4.0**

b) For the competitive liquid –phase reactions **2.0**

$$A + B \xrightarrow{k_1} R, \text{ (desired)} \quad \frac{dC_R}{dt} = 1.0 C_A C_B^{0.3}, \text{ mol/liter.min}$$

$$A + B \xrightarrow{k_2} S, \text{ (undesired)} \quad \frac{dC_S}{dt} = 1.0 C_A^{0.5} C_B^{1.8}, \text{ mol/liter.min}$$

Find the fraction of impurity in the product stream for 90% conversion of pure A and pure B (each has a density of 20 mol/liter) for plug flow and mixed flow.



University, placement, school and entrance exam question paper-How To Exam?

http://www.howtoexam.com

6	Describe the exit age distribution in non-ideal flow reactors? Describe systematically how you calculate the conversion based on the information of tracer studies.	**6.0**
7.	Describe the dispersion and tank in series model for predicting the non ideal flow behaviors in reactors.	**6.0**
8.	Consider the isothermal gaseous decomposition reaction $A \rightleftharpoons 3B$. The laboratory measurements are given in table and show the chemical reaction rate as a function of conversion.	**6.0**

X	$-r_A$ (mol/l.s)
0.0	0.0053
0.1	0.0052
0.2	0.0050
0.3	0.0045
0.4	0.0040
0.5	0.0033
0.6	0.0025
0.7	0.0018
0.8	0.00125
0.85	0.001

For the two CSTRs in series, 40% conversion is achieved in the first reactor. What is the total volume of the two reactors necessary for 80% overall conversion of the species A entering reactor 1? (If F_{A2} is the molar flow rate of A exiting from the last reactor in the sequence, $F_{A2} = 0.2\ F_{A0}$)
$F_{A0} = 0.867$ mol/s. Calculate the volume necessary to achieve 80% conversion in one CSTR.

——x——

HowToExam.com

University, placement, school and entrance exam question paper-How To Exam?