

Code No: 09A52302

R09

SET-1

**B. Tech III Year I Semester Examinations, May/June - 2012**  
**BIOCHEMICAL REACTION ENGINEERING**  
**(BIOTECHNOLOGY)**

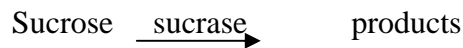
**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions**  
**All questions carry equal marks**

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1. Write difference and similarities between chemical and bioreactors. [15]
2. Explain the basic principles of sterilization. [15]
3. Design equation for enzyme reactors, Batch growth of microorganisms. [15]
4. Describe Bubble-column reactors and Airlift reactors. [15]
5. At room temperature sucrose is hydrolyzed by the enzyme sucrase as follows:



Starting with sucrose ( $C_{A0} = 1 \text{ mol/m}^3$ ) and sucrase ( $C_{EO} = 0.01 \text{ mol/m}^3$ ) the following data are obtained in a batch reactor.

$C_A \text{ mol/m}^3$	0.68	0.16	0.006
t, hr	2	6	10

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Find a rate equation to represent the kinetics of this reaction. [15]

6. Describe the dispersion model. [15]
7. Explain Factors affecting cellular oxygen demand and Oxygen transfer in fermenters. [15]
8. Explain Measurement of dissolved oxygen concentrations. [15]

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SET-2

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1. Classify the bioreactors and Reactor configuration. [15]
2. Explain Kinetics of thermal death of cells & spores. [15]
3. Explain Chemostat growth, Exponential feeding strategy. [15]
4. Design equation of plug flow reactor, Design of CSTR with washout concept. [15]
5. Describe Fluidized-bed reactor and Packed-bed reactor. [15]
6. State experimental methods for finding E. [15]
7. What is the role of glucose in the breakdown of cellulose (find the type of inhibition, and rate equation). [15]
8. Explain Sulphite oxidation method. [15]

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SET-3

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**Time: 3 hours**

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**Answer any five questions**  
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1. Describe the conventional bioreactor with all aspects. [15]
2. Design of batch and continuous sterilization, sterilization of air and filter design. [15]
3. Explain fed batch growth, continuous growth and their growth kinetic quantification. [15]
4. Design Stirred tank reactor with recycle of biomass. [15]
5. Describe Liquid impelled loop reactor, Pumped tower loop reactor. [15]
6. Define RTD, earliness of mixing and the age distribution of fluid. [15]
7. Find a rate equation to represent the breakdown of cellulose by cellulase in the absence of inhibitor. [15]
8. A 20-l stirred fermenter containing a *Bacillus thuringiensis* culture at 30°C is used for production of microbial insecticide,  $k_{L,a}$  is determined using the dynamic method. Air flow is shutoff for a few minutes and the dissolved-oxygen level drops; the air supply is then re-connected. When steady state is established, the dissolved-oxygen tension is 78% air saturation. The following results are obtained.

Time(S)	5	15
Oxidation tension(% air saturation)	50	66

- a) Estimate  $k_{L,a}$ .
- b) An error is made determining the steady-state oxygen level which, instead of 78%, is taken as 70%. What is the percentage error in  $k_{L,a}$  resulting from this 10% error in  $C_{AL}$ ? [15]

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SET-4

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**Answer any five questions**  
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1. Describe the types of sterilization. [15]
2. Describe radiation and chemical sterilization. [15]
- 3.a) Explain Batch growth quantifying cell concentration.  
b) Growth profile and kinetics in batch culture. [8+7]
4. Design Continuous tank fermenters in series without and with recycle of biomass. [15]
5. Describe Air lift reactors, multipurpose tower reactors. [15]
6. Reactant A ( $C_{A0} = 64 \text{ mol/m}^3$ ) flows through a plug flow reactor ( $\tau = 50 \text{ s}$ ), and reacts away as follows:  $A \longrightarrow R$ ,  $-r_A = 0.005 C_A^{1.5}, \text{mol/m}^3 \cdot \text{s}$ . Determine the conversion of A if the stream is: **(a)** a micro fluid **(b)** a macro fluid. [15]
7. Write role of diffusion in bio-processing and Convective mass transfer. [15]
8. State Methodology of oxygen transfer from gas bubble to cell. [15]

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