R07

Code: R7312302

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013

BIOCHEMICAL REACTION ENGINEERING - I

(Biotechnology)

Time: 3 hours Max. Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Differentiate between order and molecularity of a reaction.

(b) The rate constants of a certain reaction are 1.6 x 10^{-3} s^{-1} and 1.625 x 10^{-2} s^{-1} at 10℃ and 30℃ respectively. Calculate the activation energy.

2 (a) Explain continuous sterilization with a neat sketch.

(b) Differentiate between batch, fed-batch and continuous mode of operation.

3 Explain the models for inhibition kinetics.

4 Assume that experimental measurement for certain organisms have shown that cells can convert two-thirds (wt/wt) of the substrate carbon (alkane or glucose) to biomass.

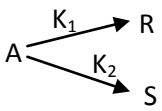
(a) Calculate the stoichiometric coefficients for the biological reactions:

Hexadecane: $C_{16}H_{34} + aO_2 + bNH_3 \rightarrow C\ (C_{4.4}\,H_{7.3}\,N_{0.86}\,O_{1.2}) + dH_2O + eCO_2$

Glucose: $C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow C\ (C_{4.4}\,H_{7.3}\,N_{0.86}\,O_{1.2}) + dH_2O + eCO_2$.

(b) Calculate the yield coefficients $Y_{X/S}$(g dw cell / g substrate), Y_{X/O_2}(g dw cell / gO_2) for both reactions.

5 Reactant A in a liquid produces R and S by following reactions.



Both these reactions are first order.

A feed with C_{AO} = 1, C_{RO} = C_{SO} = 0 enters into two mixed flow reactors in series ($\tau_1 = 2\,min$; $\tau_2 = 5\,\text{min}$). The composition in first reactor is C_{A1}=0.40, C_{R1} = 0.40 and C_{S1} = 0.2. Find composition leaving second reactor.

6 (a) Explain about activation energies of enzymatically catalyzed and un-catalyzed reactions.

(b) Explain about lock and key model of substrate complex formation.

7 (a) Give the advantages and disadvantages of different immobilization techniques.

(b) Give the effect of P^H and temperature on immobilized reaction kinetics.

8 Differentiate between film and pore diffusion effects on kinetics of immobilized enzyme reactions.

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