

IV B.Tech I Semester Supplementary Examinations, April/May 2005
BIO-CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours**Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. Write down the specific or general chemical structure as appropriate for the following substances. Comment on the functional importance of various groups on the molecule.
 - (a) Amino acid, Lysine, Tripeptide, Protein
 - (b) Globular and fibrous proteins
2. The k_m value of an enzyme is known to be 0.01 mol/l. To measure the maximum rate of reaction rate catalyzed by the enzyme, the initial rate of reaction was measured and found that 10 % of the initial substrate was consumed in 5 minutes. The initial substrate composition is 3.4×10^{-4} mol/l. Assume that the reaction can be expressed by the Michaelis-Menten kinetics.
 - (a) What is the maximum reaction rate ?
 - (b) What is the concentration of the substrate after 15 minutes ?
3. An enzyme requires the presence of a bound cofactor for the enzyme to be in the catalytically active form. The cofactor binds very tightly to the enzyme. A critical group on the cofactor has a pK_c and the cofactor is only functional when in the deprotonated form. The first pK values of the enzyme active site on either side of the pH of maximum activity are pK_1 and pK_2 . Derive appropriate velocity expressions for the conversion of a single substrate to products when the following conditions apply.
 - (a) $|pK_c| \ll |pK_1| \ll |pK_2|$
 - (b) $|pK_1| \ll |pK_c| \ll |pK_2|$
 - (c) $pK_c = pK_1$
4. Give brief account on industrial process of enzyme immobilization.
5. Discuss in detail the process for L. amino acid production with neat diagram.
6. Explain in detail about thermal death kinetics of cell and spores.
7. How are bioreactors classified? Explain the operation of a Stirred Tank fermentor with a neat sketch.
8. Draw a neat diagram of an air lift fermentor and explain its working.
