Code No: RR410807 **Set No.1**

IV B.Tech. I Semester Regular Examinations, November -2005
BIO-CHEMICAL ENGINEERING
(Chemical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Compare and contrast the general characteristics of procaryotes and eucaryotes. [16]

2. (a) What is the Lineweaver-Burk plot? How is it useful in estimating the parameters of the Michealis-Menten equation?
   (b) Initial rates of an enzyme-catalyzed reaction for various substrate concentrations are listed in the table below.

s, mol/L	v, mol/ (1.min)
4.1×10^{-3}	177
9.5×10^{-4}	173
5.2×10^{-4}	125
1.03×10^{-4}	106
4.9×10^{-5}	80
1.06×10^{-5}	67
5.1×10^{-6}	43

   Evaluate v_{max} and K_m by Lineweaver-Burk plot. [4+12]

3. Obtain the rate expression of the Michealis-Menten form for the case of totally noncompetitive inhibition. How are v_{max} and K_m affected? [16]

4. Briefly describe the manufacture of L- amino acids by resolution of racemic amino acid mixtures using immobilized aminoacylase, with a neat flow sheet. [16]

5. Discuss in detail about the EMP pathway. [16]

6. (a) Derive an expression for the time interval required to double the population of cells in batch culture.
   (b) Discuss about the dependence of substrate concentration, cell concentration, and cell production rate on the continuous culture dilution rate D as computed from Monod chemostat model. [6+10]

7. (a) Discuss about enzyme catalyzed reactions in CSTRs with the help of schematic diagrams.
   (b) Derive the general substrate balance equation for the single enzyme catalyzed reaction S → P taking place in a CSTR. [10+6]

8. Give a detailed account of anaerobic digestion for the production biogas. [16]

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Code No: RR410807 **Set No.2**

IV B.Tech. I Semester Regular Examinations, November -2005
BIO-CHEMICAL ENGINEERING
(Chemical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Sketch the diagram showing the kingdom of protists.
   (b) Write a brief note on bacteria and yeasts. [6+10]

2. (a) Give a brief description of competitive and noncompetitive inhibition and how they result in changing the values of v_{max} and K_m.
   (b) A pesticide inhibits the activity of a particular enzyme A, which can therefore be used to assay for the presence of the pesticide in an unknown sample. In the laboratory, the initial rate data shown in the table below were obtained.

	v, mol/(L.min) $\times 10^6$	
s, mol/L	No inhibitor	10^{-5} M inhibitor
3.3×10^{-4}	56	37
5.0×10^{-4}	71	47
6.7×10^{-4}	88	61
1.65×10^{-3}	129	103
2.21×10^{-3}	149	125

   Is the pesticide a competitive or noncompetitive inhibitor? [10+6]

3. Derive the Michealis-Menten form of equation for enzyme-catalyzed reactions involving two substrates. [16]

4. Briefly describe the industrial process employing immobilized enzyme catalysts for the production of high fructose syrup from corn starch. Draw the flow sheet. [16]

5. Discuss in detail about the TCA cycle. [16]

6. With the help of a typical growth curve, discuss in detail about the growth cycle phases for batch cultivation and suggest ways of reducing lag times. [16]

7. Write in detail about CSTR cell reactors with recycle and wall growth. [16]

8. Discuss in detail about continuous sterilization of media. Mention its advantages and disadvantages. [16]

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Code No: RR410807 **Set No.3**

IV B.Tech. I Semester Regular Examinations, November -2005
BIO-CHEMICAL ENGINEERING
(Chemical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Give a brief account of the following:
   (a) DNA
   (b) RNA [10+6]

2. (a) Explain in detail about the enzyme-substrate complex and enzyme action.
   (b) Derive the Michealis-Menten equation using the quasi-steady-state approximation for simple enzyme kinetics with one substrate. [6+10]

3. (a) For the case of totally competitive inhibition, derive the Michealis-Menten form of equation.
   (b) How can the reduction in the rate caused by a competitive inhibitor be over come? What is the effect on v_{max} and K_m? [12+4]

4. Give a detailed account of enzyme immobilization. [16]

5. (a) With the help of a simplified diagram of the Calvin cycle explain the synthesis of glucose from CO_2.
   (b) Write short notes on passive and facilitated diffusion. [8+8]

6. (a) Write the equations for specific growth rate when it is influenced by substrate and product inhibition.
   (b) Define the yield coefficient for biomass and products, and show how they are used in steady mass balance on substrate and product.
   (c) Write the Monod equation and explain its parameters. What are its limitations? [4+6+6]

7. Derive suitable expressions for estimating effluent substrate and cell mass concentration in an ideal PFR using Monod kinetics. [16]

8. (a) Discuss about the different methods of scale up of bioreactors.
   (b) Discuss in detail about the power requirements of agitated vessels under non aerated and aerated conditions. [8+8]

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Code No: RR410807 **Set No.4**

IV B.Tech. I Semester Regular Examinations, November -2005
BIO-CHEMICAL ENGINEERING
(Chemical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write about the different factors which determine the different levels of protein structure.
   (b) Amino acids are the building blocks of proteins. Explain briefly. [10+6]
2. (a) What are the differences and similarities between enzymes and synthetic catalysts? Explain.
   (b) Give the classification of enzymes and the major classes of reactions that they catalyze. [8+8]
3. (a) Derive the Michealis-Menten equation for simple enzyme kinetics with single substrate using the Michealis equilibrium approach.
   (b) An enzyme with a K_m of 1 $\times 10^{-3}$ M was assayed using an initial substrate concentration of 3 $\times$ 10^{-5} M. After 2 min, 5 percent of the substrate was converted. How much substrate will be converted after 10, 30, and 60 min? [10+6]
4. Give a detailed account of the utilization and regeneration of cofactors. [16]
5. (a) Discuss in detail about active transport, with examples.
   (b) Explain briefly about the synthesis of small molecules. [8+8]
6. Derive the equations of the Monod chemostat model. Show how these equations can be readily solved for the case of sterile feed. [16]
7. (a) With the help of a schematic diagram explain the steps involved in transport of oxygen from a gas bubble to the inside of a cell.
   (b) Write a brief note on determination of oxygen transfer rates by the sulfite oxidation method. [8+8]
8. Write short notes on the production of:
   (a) Antibiotics
   (b) Ethanol [16]

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