

II B.Tech I Semester Examinations, May/June 2012
THERMODYNAMICS FOR BIOTECHNOLOGISTS
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. A System has equation of state $PV=ZRT$.
 Show that. $\left(\frac{\partial H}{\partial P}\right)_T = -\frac{RT^2}{P} \left(\frac{\partial Z}{\partial T}\right)_P$
 Given $\left(\frac{\partial H}{\partial P}\right)_T = V - T \left(\frac{\partial V}{\partial T}\right)_P$ [16]
2. Explain the nature of excess properties with neat diagrams? [16]
3. Anaerobic digestion of volatile acids by methane bacteria is represented by the equation
 $CH_3COOH + NH_3 \rightarrow biomass + CO_2 + H_2O + CH_4$ The composition of the methane bacteria is approximated by the empirical formula $CH_{1.4}O_{0.4}N_{0.20}$. For each kg of acetic acid consumed 0.67 kg CO_2 is evolved. How does the yield of methane under these conditions compare with maximum possible yield?

	Y_s	Y_{xs} (Mass Yield)	$C_{max/w}$ Carbon Yield
Acetic Acid	4.0	0.8	0.95

 [16]
4. Explain P-x-y and T-x-y diagrams for Vapor liquid equilibrium. [16]
5. With a neat sketch explain the working principle of Fed batch reactor. [16]
6. Write short notes on:
 - (a) Respiratory chain
 - (b) Secondary Metabolite. [8+8]
7. Ethanol is esterified to produce ethyl acetate at 100^0 C and 1 atm according to the reaction
 $CH_3COOH (l) + C_2H_5OH (l) \rightarrow CH_3COOC_2H_5 (l) + H_2O(l)$
 What is the composition of the reaction mixture if initially 1 mole each of acetic acid and ethol are present. Given K at $100^0C = 0.25$. [16]
8. Write short notes on:
 - (a) The reversible process(mechanical)
 - (b) Reversible chemical reaction. [8+8]

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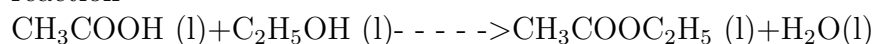
(a) Respiratory chain

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