

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
BIO CHEMICAL THERMODYNAMICS
(Bio-Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. A reversible engine operating between a reservoir at 600K and the ambient atmosphere at 300K drives a refrigerator operating between 240K and the ambient atmosphere. Determine the ratio of energy rejected by both the devices to the ambient atmosphere to the energy absorbed by the engine from the reservoir at 600K. [16]
2. (a) Name the two conditions, which every equation of state should satisfy
 (b) What are the units of the Vanderwaals constant a and b. [8+8]
3. A particular thermodynamic system has the following the equations of state. $\frac{1}{T} = \frac{5NR}{2U} + \frac{P}{T} = \frac{NR}{V}$ obtain the third equation of state of the system. [16]
4. (a) Discuss the importance of fugacity in thermodynamics.
 (b) Discuss fugacity and fugacity coefficient for pure species. [16]
5. (a) What are the equilibrium criteria for LLE? Compare than with VLE For liquid species in equilibrium, show that $x_i^\alpha \gamma_i^\alpha = x_i^\beta \gamma_i^\beta$ ($i = 1, 2, \dots, N$)
 (b) Discuss LLE by giving suitable examples. [8+8]
6. The water gas show it reaction, $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$ is carried out under the different sets of conditions listed below. Calculate the fraction of steam reacted in each case. Assume the mixture behaves as an ideal gas.
 - (a) the reactants consists of 1mol of H_2O vapour and 1 mol of CO. The temperature is 1100 K and the pressure is 1bar. The equilibrium constant $K=1.0$ (6)
 - (b) Same as (a) except that pressure is 10 bar. (5)
 - (c) Same as (a) except that 2 mol of is included in the reactants. (5)
7. Explain the relationship between EMP pathway and Arginine Amino acid. [16]
8. Discuss in detail the heat evolved per equivalent of available electrons transferred to oxygen. [16]
