

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

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. You wish to calculate ΔE and ΔH for an ideal gas which is changed in some process from an initial condition of 40°F and 10 atm abs to 140°F and 1 atm abs. Devise a reversible nonflow process (any number of steps) for accomplishing this change, and calculate (in Btu) ΔE and ΔH for the process, taking 1 lb mole of the gas as your basis $C_p = 7$ and $C_v = 5$ Btu/ (lb mole) ($^\circ\text{F}$). [6+10]
2. (a) Describe Rankine's power cycle with a T-S diagram and its distinguishing features over Carnot's cycle.
(b) How is refrigeration accomplished, and what is meant by a "ton of refrigeration"? [8+8]
3. (a) Write Clapeyron equation.
(b) Assume that the vapor phase is an ideal gas and that the molar volume of liquid is negligible in comparison with that of the vapor and simplify the Clapeyron equation. Mention the limitations of the resulting Clausius/ Clapeyron equation. [8+8]
4. (a) Describe the important characteristics of an ideal gas mixture and write Gibb's theorem.
(b) Derive the property equations describing the ideal gas behavior of mixtures. [8+8]
5. Develop equations that apply to the limiting case of binary LLE for which the α phase is very dilute in species 1 and the β phase is very dilute in species 2. [4+12]
6. Consider a vessel which initially contains only n_0 mol of water vapour .If decomposition occurs according to the reaction.
$$\text{H}_2\text{O} \rightarrow \text{H}_2 + 1/2\text{O}_2$$

Find expression which relate the number of moles and the mole fraction of each chemical species to the reaction co-ordinate ϵ [4+12]
7. Explain in detail how EMP pathway can be used in five different pathways. [6+10]
8. Discuss in detail about the Heat Generation and Yield Factor Estimates. [8+8]
