11129 : Polymer Engineering Thermodynamics : 6 PP 04

P. Pages : 2
Time : Three Hours

AW - 3254
Max. Marks : 80

Notes :
1. Answer **Three** question from Section "A" and **Three** question from Section "B".
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemicals equations should be given wherever necessary.
5. Illustrate your answer necessary with the help of neat sketches.
6. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. Prove that **14**

i) Cp - Cv = nR for an ideal gas.

ii) Joule Thomson expansion is an isenthalpic process.

iii) $\left(\frac{\partial H}{\partial P}\right)_T = 0$ for an ideal gas.

OR

2. a) Prove that the magnitude of the work done by the system in a reversible isothermal expansion of an ideal gas is greater than that of irreversible expansion. **6**

b) Explain in detail: **8**

1) State functions of properties of state function
2) State of equilibrium and types of equilibrium.

3. Explain in detail **13**

i) Criteria for equilibria at constant. T & V

ii) Criteria for equilibria at constant T & P.

OR

4. a) Explain why increase in entropy is associated with the approach to equilibrium in an isolated system. **5**

b) Calculate the rate of change of transition temperature with pressure for Sulphur. The data given are transition temperature = 95.5°C at 1 atm, Enthalpy of transition per gram of Sulphur is 13.4 J. Monoclinic Sulphur (Stable above transition point) has greater specific volume than that of Rhombic Sulphur by 0.0126 cm^3g^{-1} **8**

5 a) Define colligative properties and show that Elevation of boiling point is a colligative property. **7**

b) The boiling point elevation of a solute is observed to be 2.3 °K when 13.8 gm of solute of molar mass of 154 gm/mole. is added. Calculate Kb and ΔHvap of the solvent. **6**

OR

6. a) Explain in detail how does the weight of polymer is useful in determining the molecular weight of polymer. 6

b) Calculate the free energy of mixing ΔG mix enthalpy of mixing ΔH mix, ΔS mix at 25°C and 1 atm when 7
1) 10 moles of H are mixed with 10 moles of Ne
2) 10 moles of He are mixed with 20 moles of Ne.

SECTION - B

7. a) Explain the concept of: 10
1) Gels of polymers
2) Colloidal dispersions of polymer.

b) Explain in detail the degree and kinetics of swelling. 4

OR

8. a) Explain in details the factors affecting dissolution and swelling of polymers. 7

b) Explain the concept of polyelectrolytic solution in detail. 7

9. a) Explain Flory Huggins theory and derive expression for the entropy of polymer solvent mixing. 7

b) Explain the thermodynamics of fusion of pure polymer. 6

OR

10. a) Explain enthalpy or heat of mixing for polymers. 4

b) Explain variation of thermodynamic affinity of an polymer to a solvent with temperature criteria of upper critical solution temperature and lower critical solution temperature. 9

11. a) Prove that $Kc = Kp\,(RT)^{\Delta x}$ for reaction equilibrium constant. 7

b) What is the feasibility of any chemical reaction? Develop thermodynamic expression for homogeneous reaction to calculate reaction equilibrium constant from enthalpy, entropy, heat of formation data. 6

OR

12. a) i) At 1600 K and 1.1 atm one gram of a substance Az (gas) occupies 1.95 liters after dissociation. Calculate Kp, Kc of Kx for the reaction $\frac{1}{2}\,Az\,(g) \rightleftharpoons A(g)$ 9
ii) Calculate Kp, Kc of Kx at 2.0 atm.
(mol. col. at Az = 71)

b) Prove thermodynamically. That in a chemical reaction an increase in temperature shifts equilibrium to the high enthalpy side. 4

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