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Third Semester (B. Tech.) Chemical Engineering and Engineering Physics

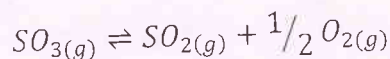
CY2001: PHYSICAL CHEMISTRY

Test I: August 2012

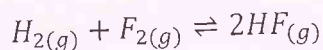
Time: 1 hour
Max Marks: 15

(Answer all questions)

1. Describe the conditions for spontaneity of a reaction. (2 marks)
2. Discuss the Lead-Silver eutectic system. (2 marks)
3. The addition of 5 g of a compound to 250 g of naphthalene (Enthalpy of fusion = 19107 J mol^{-1} , melting point = 80.26°C and molar mass = $128.17 \text{ g mol}^{-1}$) lowered the freezing point of the solvent by 0.780 K . Calculate the molar mass of the compound. (2 marks)
4. The complex compound $\text{Al}_2(\text{SO}_4)_3$ in 0.1 M aqueous solution, maintained at 27°C , is 45% dissociated. Calculate the osmotic pressure of the solution. (2 marks)
5. At 1 atm pressure and 627°C , SO_3 is partially dissociated into SO_2 and O_2 as per the given equation.



- a) If the density of equilibrium mixture is 0.925 g/liter , what is the degree of dissociation of SO_3 under these conditions?
 - b) If $K_p = 3.3 \times 10^{-8} \text{ atm}$ for the given reaction at the given temperature, estimate ΔG° . (3 marks)
6. For the following reaction at a certain temperature, it is found that the equilibrium concentrations in a 5 L container are $[\text{H}_2] = 0.05 \text{ M}$, $[\text{F}_2] = 0.01 \text{ M}$, and $[\text{HF}] = 0.4 \text{ M}$. To this equilibrium mixture 0.238 M of F_2 is added, calculate the concentrations of all gases once equilibrium is reestablished.



(4 marks)
