

MID-SEM EXAMINATION 2018

(CH4103: Chemical Thermodynamics, Date: 03 Nov. 2018)

Total Marks: 20; Time: 11 am (Venue: LHC 112). Duration: 1 hr

(Attempt ALL questions).

Q1. A container is divided into two equal compartments. One contains 3.0 mol H_2 at 25 C; the other contains 1.0 mol N_2 at 25 C. Calculate the Gibbs energy of mixing when the partition is removed. Assume that the gases behave ideally. (2)

Q2. Derive the final temperature and the associated work done for a Carnot cycle running multiple times. (3)

Q3. What is Osmometry? Please state its working principle (3)

Q4. A solution comprising 0.1 mol of naphthalene and 0.9 mol of benzene is cooled until some solid benzene freezes out. The solution is then decanted off from the solid, and warmed to 353 K, where its vapor pressure is found to be 670 Torr. The freezing and normal boiling points of benzene are 278.5 K and 353 K, respectively, and its enthalpy of fusion is 10.67 kJ/mol. Calculate the temperature to which the solution was cooled originally and the amount of benzene that must have frozen out. Assume conditions of ideal solution. (3)

Q5. The partial molar volume of methanol in a methanol-water solution at $x_{\text{methanol}} = 0.39$ is 39.2 cm^3/mol . The density of solution is 0.91 g/cm^3 . Calculate partial molar volume of water in solution. (3)

Q6. Show that for a van der Waals gas:

(a) $\ln(f/p) = \ln \{RT/p(V_m-b)\} + b/(V_m-b) - 2a/RTV_m$ (3)

(b) $\ln(f/p) = -ap/(RT)^2 + bp/RT + abp^2/2(RT)^3$ (3)

(Please attach the question paper with the answer script. Use the remaining space for rough)

SK
03/11/18.