KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2007/2008
INSTITUTE OF OPEN LEARNING

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 403: PHASE EQUILIBRIA

DATE: MONDAY, 7TH JULY 2008 TIME: 10.30 A.M. – 12.30 P.M.

INSTRUCTIONS: ANSWER ALL QUESTIONS.

1. (a) Distinguish between
   (i) Osmosis and Osmotic pressure
   (ii) Triple point and Eutectic point
   (iii) Congruent melting and incongruent melting point.
   (iv) Boiling point elevation and freezing point depression of a solution.
   (8 marks)

   (b) Show that the triple point of water is invariant. (2 marks)

   (c) (i) Give both phase rule and condensed phase rule.
   (ii) Define the terms employed in phase rule.
   (5 marks)

2. (a) Draw a well-labeled phase diagram of a water system. (10 marks)
   (b) The vapour pressure of pure ccl_4 and $sncl_4$ at 20^oC are 114.9 mmHg and 238.9 mmHg respectively.
   Assuming ideal behavour, determine the total vapour pressure of a mixture of 8 gms of ccl_4 and 12 gm of $sncl_4$ liquids respectively.

3. (a) Explain how you would determine the molecular weight of a substance in solution form its osmotic pressure. (5 marks)

(b) Using clapeyron equation, show that clausius clapeyron equation is

$$\log \frac{P_2}{P_1} = \frac{\Delta Hv}{2.303R}\left(\frac{T_2 - T_1}{T_1 T_2}\right)$$

(5 marks)

(c) Calculate the heat of vapourisation of acetone if the vapour pressure of acetone at 0^oC is 53.46 mmHg and at 30^oC it is 237 mmHg.

(R = 1.987 cal)

(5 marks)

4. (a) Use the following data to draw a phase diagram for substance A and B system.

(i) Melting point of B is 655^oC

(ii) Melting point of A is 500^oC

(iii) One eutectic point at 180^oC with 25% A and another at 350^oC with 85% of A.

(iv) A solid compound BA_2 is formed which melts at 580^oC.

(15 marks)

(b) Draw and label a sulphur system phase diagram.
State the number of triple points in this phase diagram. (10 marks)

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