Chemistry-4311
October 21, 2016

Quiz #6 **Name** Key

R = 8.314 J/mol-K = 0.08206 L-atm/mol-K = 1.987 cal/mol-K, $N_A = 6.02 \times 10^{23}$

1. Matching (Use a letter only once)

The entropy of hydration of Cl^- is greater than that of I^- (yes or (no)) d.

ΔH_{mixing} is c for an ideal solution.

Relationship between vapor pressure and temperature is g.

The enthalpy for $Na^+(g) + Cl^-(g) \rightarrow Na^+(aq) + Cl^-(aq)$ is called the f.

In e diffusion an ion moves from a region of high concentration to a region of low concentration.

a. positive
b. $\Delta H_{solution}$
c. zero
d. no
e. simple
f. $\Delta H_{hydration}$
g. $\ln P = -\Delta H_{vap}/RT + C$
h. yes
i. facilitated
j. $P = \Delta H_{vap}/RT$

(3) 2. An ideal solution is made from 5.00 mol of benzene and 3.25 mol of toluene. At 298 K, the vapor pressure of the pure substances are $P^*_{benzene} = 96.4$ torr and $P^*_{toluene} = 28.9$ torr.
(a) What is the mole fraction of benzene in the solution?

$$X_{benzene} = \frac{5.00}{8.25} = 0.606$$

(b) What is the total vapor pressure of this solution.

$$P_{total} = P_{benzene} + P_{toluene} = 0.606 \times 96.4 + 0.394 \times 28.9$$

$$= 58.4 + 11.4 = 69.8 \text{ torr}$$

(2) 3. The vapor pressure of isopropyl alcohol is 40 torr at 297 K and 760 torr at 356 K. What is ΔH_{vap} for isopropyl alcohol?

$$\ln P = -\frac{\Delta H_{vap}}{RT} + C$$

$$\ln P_2 = -\frac{\Delta H_{vap}}{RT_2} + C$$

$$\ln P_1 = -\frac{\Delta H_{vap}}{RT_1} + C$$

Subtract

$$\ln P_2 - \ln P_1 = -\frac{\Delta H_{vap}}{RT_2} + \frac{\Delta H_{vap}}{RT_1}$$

$$\ln \frac{P_2}{P_1} = -\frac{\Delta H_{vap}}{R}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$$

$R = 0.0826$ $\Delta H_{vap} = 436$ L-atm

$R = 8.314$ $\Delta H_{vap} = 43,870$ J

$= 43.87$ kJ