UNIVERSITY CEU SAN PABLO
SCHOOL OF PHARMACY
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

PROBLEMS OF PHYSICAL CHEMISTRY

2018-2019

LESSON 6

16. When 1 g of urea, $CO(NH_2)_2$, is dissolved in 200 g solvent A, the melting point decreases 0.250 ^oC. When 1.5 g of Y are dissolved in 125 g of the same solvent A, the melting point decreases 0.200 ^oC. Calculate:

a) the molecular weight of Y

b) the molar melting enthalpy of A

Data: $R = 0.082\ l \cdot atm \cdot K^{-1} \cdot mol^{-1} = 1.987\ cal \cdot K^{-1} \cdot mol^{-1} = 8.314\ J \cdot K^{-1} \cdot mol^{-1}$
$M(A) = 200\ g \cdot mol^{-1}$; $M(urea) = 60\ g \cdot mol^{-1}$; $T_m(A) = 12\ ^oC$

17. The melting temperatures of solutions 0.1 molal of KCl, K_2SO_4 and $MgSO_4$ are -0.346, -0.452 and -0.247 ^oC, respectively. Calculate for each:

a) the Van't Hoff's coefficient, i

b) the degree of dissociation, α

c) the melting temperature of a solution containing the three solutes together, each 0.1 molal

Data: $Kc\ (H_2O) = 1.86\ K \cdot kg \cdot mol^{-1}$

18. The vapour pressure of an aqueous solution of urea, $CO(NH_2)_2$, at 100 ºC is 743.1 mmHg. Calculate the osmotic pressure of this solution at 20 ºC and its melting temperature.

Data: $R = 0.082\ L \cdot atm \cdot K^{-1} \cdot mol^{-1} = 1.987\ cal \cdot K^{-1} \cdot mol^{-1} = 8.314\ J \cdot K^{-1} \cdot mol^{-1}$
$P_{solution} = 1.023\ g \cdot mL^{-1}$; $M\ (H_2O) = 18\ g \cdot mol^{-1}$; $M\ (CO(NH_2)_2) = 60\ g \cdot mol^{-1}$
$K_f\ (H_2O) = 1.86\ K \cdot kg \cdot mol^{-1}$