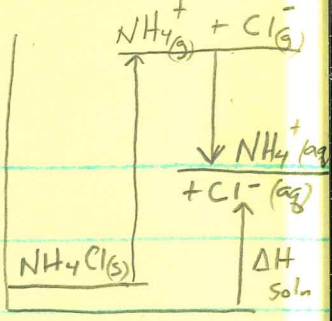
Ch 14 Solutions Exercises



34) a) hexane LD b) water LD, dip-dip, H-bond
c) hexane LD d) water LD, dip-dip, H-bond

35) a) endo b) lattice > heat of hydration c)
d) soln forms due to ↑ in entropy

41) Unsat sol @ 25°C = 35g NaCl/100g H_2O

43) 40° 45g (unsat) − 0° 14g = 31g KNO_3

47) As P ↑ nitrogen gas will dissolve more easily Diver should ascend to a depth w/ lower pressure.

51) $\frac{112\text{g NaCl}}{1.00\text{L soln}} \times \frac{1\text{mol}}{58.44\text{g}} = 1.92 \frac{\text{mol}}{\text{L}}\,(\text{M})$

$1.00\text{L} \times \frac{1000\text{mL}}{1\text{L}} \times \frac{1.08\text{g}}{1\text{mL}} = 1080\text{g soln}$

$1080\text{g soln} - 112\text{g NaCl} = 968\text{g } H_2O$

$\frac{112\text{g NaCl}}{1.00\text{L soln}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1\text{mL}}{1.08\text{g soln}} \times 100 = 10.4\%$

$112\text{g NaCl} \times \frac{1\text{mol}}{58.44\text{g}} = 1.916\text{ mol NaCl}$

$\frac{1.916\text{ mol NaCl}}{0.968\text{Kg } H_2O} = 2.0\text{ m}$

53) $3.05\text{g KI} \times \frac{1\text{mol}}{166.01\text{g KI}} = 0.01837\text{ mol KI}$

$\frac{0.01837\text{ mol KI}}{25.0\text{mL}} \times \frac{1000\text{mL}}{1\text{L}} = 0.7348\text{ M}$

$M_1V_1 = M_2V_2$

$V_2 = \frac{(5.0\text{M})(50.0\text{mL})}{(0.7348\text{M})} = 340.\text{ mL}$

58) $150\text{mg Pb} \times \frac{1\text{g Pb}}{1000\text{mg Pb}} \times \frac{100\text{g soln}}{0.0011\text{g Pb}} \times \frac{1\text{mL}}{1.0\text{g soln}} = 14{,}000\text{ mL}$

59) $1.15\text{L} \times \frac{0.100\text{mol HNO}_3}{1\text{L}} \times \frac{63.02\text{g}}{1\text{mol}} \times \frac{100\text{g conc}}{70.3\text{g}} \times \frac{1\text{mL conc}}{1.41\text{g}} = 7.31\text{mL conc}$

Place about 1L dist H_2O in container slowly pour 7.31mL conc in the water → allow to cool then add more dist H_2O till 1.15L total

65) $\frac{3.0\text{ g } H_2O_2}{100\text{ g soln}} \times \frac{1\text{ mol}}{34.02\text{ g}} \times \frac{1.01\text{ g soln}}{1\text{ mL}} \times \frac{1000\text{ mL}}{1\text{ L}} = 0.89 \frac{\text{mol}}{\text{L}}\ (M)$

71) $P_{soln} = \chi_{solv} P^\circ_{solv}$

$= 0.966(31.8) = 30.7 \text{ torr}$

$24.5\text{ g } C_3H_8O_3 \times \frac{1\text{ mol}}{92.09\text{ g}} = 0.2660\text{ mol } C_3H_8O_3$

$135\text{ mL } H_2O \times \frac{1.00\text{ g}}{1\text{ mL}} \times \frac{1\text{ mol}}{18.01\text{ g}} = 7.496\text{ mol } H_2O$

$\chi_{H_2O} = \frac{7.496\text{ mol}}{7.496 + 0.2660} = 0.966$

77) $55.8\text{ g } C_6H_{12}O_6 \times \frac{1\text{ mol}}{180.16\text{ g}} = \frac{0.3097\text{ mol}}{0.455\text{ Kg } H_2O} = 0.681\text{ m}$

$\Delta T_f = K_f \times m = 1.86^\circ C/m \times 0.681\text{ m}$ $\quad 1.27^\circ C$ $\quad T_f = -1.27^\circ C$

$\Delta T_b = K_b m = 0.512^\circ C \times 0.681\text{ m}$ $\quad 0.349^\circ C$ $\quad T_b = 100.349^\circ C$

79) $\frac{10.0\text{ g } C_{10}H_8}{100.0\text{ mL (cm}^3)} \times \frac{1\text{ mol}}{128.2\text{ g}} \times \frac{1\text{ cm}^3}{0.877\text{ g}} \times \frac{1000\text{ g}}{1\text{ Kg}} = 0.889\text{ m}$

$\Delta T_f = 5.12^\circ C/m \times 0.889\text{ m} = 4.55^\circ C \quad T_f = 5.5^\circ C - 4.55^\circ C = 0.95^\circ C \rightarrow 1.0^\circ C$

$\Delta T_b = 2.53^\circ C/m \times 0.899\text{ m} = 2.27^\circ C \quad T_b = 80.1^\circ C + 2.27^\circ C = 82.4^\circ C$

81) $\Delta T_f = 1.8^\circ C \quad m = \frac{\Delta T_f}{K_f} = \frac{1.8^\circ C}{1.86^\circ C/m} = 0.968\text{ m}$

$0.1000\text{ Kg} \times \frac{0.968\text{ mol}}{\text{Kg}} = 0.0968\text{ mol} \quad MM = \frac{17.5\text{ g}}{0.0968\text{ mol}} = 180\text{ g/mol}$

83) $\Pi = MRT \quad \frac{24.6\text{ g}}{0.2500\text{ L}} \times \frac{1\text{ mol}}{92.09\text{ g}} = 1.068\text{ M}$

$\Pi = \left(1.068 \frac{\text{mol}}{\text{L}}\right)\left(0.08206 \frac{\text{L}\cdot\text{atm}}{\text{K}\cdot\text{mol}}\right)(298\text{ K}) = 26.1\text{ atm}$

85) $M = \frac{\Pi}{RT} = \frac{3.22\text{ torr}}{\left(62.4 \frac{\text{torr}\cdot\text{L}}{\text{K}\cdot\text{mol}}\right)(298\text{ K})} = 1.73 \times 10^{-4} \frac{\text{mol}}{\text{L}} \times 0.0250\text{ L} = 4.33 \times 10^{-6}\text{ mol}$

$MM = \frac{0.02755\text{ g}}{4.33 \times 10^{-6}\text{ mol}} = 6360\text{ g/mol}$

87b) $\frac{21.5\,g\,CuCl_2}{0.450\,Kg\,H_2O} \times \frac{1\,mol}{134.45\,g} = 0.355\,m$ $\Delta T_b = i K_b m = 3 \times 0.512\,^\circ C/m \times 0.355\,m$

$= 0.545\,^\circ C$

$T_b = 100.545\,^\circ C$

$\Delta T_f = i K_f m$

$= 3 \times 1.86\,^\circ C/m \times 0.355\,m = 1.98\,^\circ C$ $T_f = -1.98\,^\circ C$

91a) $\Delta T_f = i K_f m = 3.4 \times 1.86\,^\circ C/m \times 0.100\,m = 0.632\,^\circ C$ $T_f = -0.632\,^\circ C$

93) $i = \frac{\Delta T_b}{K_b m} = \frac{1.4\,^\circ C}{(0.512\,^\circ C/m)(1.2\,m)} = 2.3$

106) $2.4\,g\,Na \times \frac{100\,g\,soln}{0.050\,g\,Na} \times \frac{1\,mL}{1.0\,g} \times \frac{1\,L}{1000\,mL} = 4.8\,L$

112) $\Pi = i M R T = 5 \times 0.375\,mol/L \times 0.08206\,\frac{L \cdot atm}{mol \cdot K} \times 310\,K = 47.7\,atm$

$\frac{28.5\,g\,Mg_3(C_6H_5O_3)_2}{0.235\,L} \times \frac{1\,mol}{323.13\,g} = 0.375\,M$ $\frac{37}{\frac{273}{310}}$