Ch 14 Practice Test

1) $\frac{7.80\ g\ C_6H_{12}O_6}{100\ g\ \text{solution}} \times \frac{1\ mol\ C_6H_{12}O_6}{180.16\ g} = .04329\ mol\ C_6H_{12}O_6$

$\therefore 92.2\ g\ H_2O \left(\times \frac{1\ mol\ H_2O}{18.02\ g} = 5.17\ mol\ H_2O\right)$ oops... didn't need this!

$m = \frac{mol}{kg} = \frac{.04329\ mol\ C_6H_{12}O_6}{.0922\ kg\ H_2O} = .4695 = \boxed{.470\ m}$ (A)

2) $\frac{.0311\ mol\ NH_4Cl}{1.00\ mol\ \text{solution}}$

$mol\ H_2O = 1.00\ mol - .0311\ mol$
$= .9689\ mol\ H_2O$

$.9689\ mol\ H_2O \times \frac{18.02\ g\ H_2O}{1\ mol} = 17.46\ g\ H_2O$

$m = \frac{mol}{kg} = \frac{.0311\ mol\ NH_4Cl}{.01746\ kg\ H_2O}$

$= \boxed{1.78\ m}$ (A)

3) $\frac{11.5\ g\ Na_2SO_4}{100\ g\ \text{solution}}$ $\quad 11.5\ g\ Na_2SO_4 \times \frac{1\ mol\ Na_2SO_4}{142.04\ g} = .08095\ mol\ Na_2SO_4$

$\therefore (100 - 11.5) = 88.5\ g\ H_2O \quad 88.5\ g\ H_2O \times \frac{1\ mol\ H_2O}{18.02\ g} = 4.91\ mol\ H_2O$

$X = \frac{.08095\ mol}{(.08095 + 4.91)\ mol} = \boxed{.0162}$ (E)

4) $\frac{2.15\ mol\ NaNO_3}{1000\ g\ H_2O}$ $\quad X = \frac{2.15\ mol\ NaNO_3}{(2.15\ mol + 55.49\ mol)} = \boxed{.0373}$ (C)

$1000\ g\ H_2O \times \frac{1\ mol\ H_2O}{18.02\ g} = 55.49\ mol\ H_2O$

(5) $\frac{1.34 \text{ mol } NiCl_2}{1.00 \text{ L soln}}$ $1.00 \text{ L} = 1000 \text{ mL} = 1000 \text{ cm}^3 \text{ soln}$

$1000 \text{ cm}^3 \times \frac{1.12 \text{ g soln}}{1 \text{ cm}^3} = 1120 \text{ g soln}$

$1.34 \text{ mol } NiCl_2 \times \frac{129.6 \text{ g } NiCl_2}{1 \text{ mol } NiCl_2} = 173.664 \text{ g } NiCl_2$

$\% = \frac{173.664 \text{ g } NiCl_2}{1120 \text{ g soln}} \times 100 = \boxed{15.5\%}$ (c)

(6) $\frac{1.25 \text{ mol } Cu(NO_3)_2}{1.00 \text{ L soln}}$ $1.00 \text{ L} = 1000 \text{ mL} = 1000 \text{ cm}^3 \text{ soln}$

$1000 \text{ cm}^3 \times \frac{1.19 \text{ g soln}}{1 \text{ cm}^3} = 1190 \text{ g soln}$

$1.25 \text{ mol } Cu(NO_3)_2 \times \frac{187.56 \text{ g } Cu(NO_3)_2}{1 \text{ mol } Cu(NO_3)_2} = 234.45 \text{ g } Cu(NO_3)_2$

$\% = \frac{234.45 \text{ g } Cu(NO_3)_2}{1190 \text{ g soln}} \times 100 = \boxed{19.7\%}$ (e)

(7) $\frac{34.0 \text{ g HBr}}{100.0 \text{ g soln}}$ (100.0 − 34.0 = 66.0 g H_2O) not needed

$34.0 \text{ g HBr} \times \frac{1 \text{ mol HBr}}{80.9 \text{ g HBr}} = .42027 \text{ mol HBr}$

$100.0 \text{ g soln} \times \frac{1 \text{ cm}^3 \text{ soln}}{1.31 \text{ g soln}} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} = .07634 \text{ L}$

$M = \frac{.42027 \text{ mol HBr}}{.07634 \text{ L soln}} = \boxed{5.505 \text{ M}}$ (c)

NOTE: If I had used fewer sig figs I would get 5.50M

(8) $\frac{.050\ g\ As^{3+}}{10^6\ g\ soln}$

$As = 74.92\ g/mol$
$Cl_3 = 106.35\ g/mol$
$181.27\ g/mol$

$.050\ g\ As^{3+} \times \frac{1\ mol\ As^{3+}}{74.92\ g\ As^{3+}} \times \frac{1\ mol\ AsCl_3}{1\ mol\ As^{3+}} \times \frac{181.27\ g\ AsCl_3}{1\ mol\ AsCl_3} = .120976\ g\ AsCl_3$

$8.2\times10^5\ L \times \frac{1000\ mL}{1\ L} \times \frac{1\ g}{1\ mL} = 8.2\times10^8\ g$

$\frac{.120976\ g}{10^6\ g} = \frac{x}{8.2\times10^8\ g}$

$x = 99.2\ g\ AsCl_3$ (e)

(9) $X_{solvent} = \frac{1.00\ mol\ solvent}{1.30\ mol\ total} = .769 \approx .77$ (C)

(10) mol fraction (A) Refers to Raoult's Law

$P_{solvent} = X_{solv.} \cdot P^\circ_{solvent}$

(11) molar mass (E) say the empirical formula is CH_2, is the molecule C_4H_4? C_3H_6? C_4H_8?

RAST's method would be useful at this point.

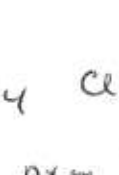
(12) molarity (D)  Good for measuring volume of soln.

(13) increase (A) think about pressurized soda and Henry's Law $S_g = k_H P_g$

S_g: solubility of gas; P_g: pressure of gas

(14) Low Vp = most particles in the way.
DO NOT confuse this with comparing IMF's of pure substances ... (ch 13) ... these are solutions

a) $i = 1$ (b) $i = 3$ c) $i = 2$ d) $i = 2$ e) ~~i~~ not a solution

(15) CCl_4  non polar molecule

(B) the polar H_2O's STICK TO OTHER polar H_2O's ... exclude CCl_4

(16) 1m NaCl $i = 2 \approx 2m$
a) 1m $i = 1 \approx 1m$
b) H_2O not a soln.
c) 1m $i = 3 \approx 3m$
d) .5m $i = 1 \approx 1m$ * alcohol ... not ionic
(e) 1m $i = 2 \approx 2m$
*NOTE: ALCOHOL LOWERS BP, not raises it ... forms vapor.

(17) BE CAREFUL
HIGH FP = least # of particles getting in the way
(E) pure H_2O
each solute will Lower the F.P.

(18) .15 m in ions = .05 m $MgCl_2$ $MgCl_2 \rightarrow \underbrace{Mg^{2+} + 2Cl^-}_{3 \text{ ions}}$

$$400.\text{ g } H_2O \times \frac{1\text{ kg } H_2O}{1000\text{ g } H_2O} \times \frac{.05\text{ mol } MgCl_2}{1\text{ kg } H_2O} \times \frac{95.2\text{ g } MgCl_2}{1\text{ mol } MgCl_2} = \boxed{1.904\text{ g } MgCl_2}$$ (B)

molar mass

memorize or learn to derive this formula.

(19) $M = \frac{k \cdot w \cdot 1000}{\Delta T \cdot W} = \frac{(-20.0\,^\circ C/m)(.500\,g)(1000)}{(-8.94\,^\circ C)(12.06\,g)}$

$= \boxed{93.2\ g/mol}$ (A)

(20) $4.134\,g\ Naphth \times \frac{1\,mol\ naphth}{128.2\,g} = .03224\,mol$

$m = \frac{.03224\,mol\ naphthalene}{(30.0\,g\ p\text{-dichl.} \times \frac{1\,kg}{1000\,g})} = 1.075\ m$

$\Delta T = k \cdot m \cdot i$ $\quad i = 1$ organic cmpd

$\Delta T = -7.10\,^\circ C/m \cdot 1.075\,m$

$= -7.63\,^\circ C$ lower than $53.0\,^\circ C = \boxed{45.4\,^\circ C}$ (C)

$53.0 - 7.63 = 45.4\,^\circ C$

(21) $M = \frac{k \cdot w \cdot 1000}{\Delta T \cdot W} = \frac{(3.63)(4.28)(1000)}{(2.30)(25.0)} = \boxed{270.2\ g/mol}$ (E)

(22) (B) ex $NaCl \rightarrow Na^+ + Cl^-$

but some stick together in solution Na^+Cl^- and count as 1 particle.