HW 3 — KITCH

1. $CaCl_2 \xrightarrow{H_2O} Ca^{2+}(aq) + 2\,Cl^-(aq)$
2. $K_2SO_4 \xrightarrow{H_2O} 2\,K^+(aq) + SO_4^{2-}(aq)$
3. $(NH_4)_2S \xrightarrow{H_2O} 2\,NH_4^+(aq) + S^{2-}(aq)$
4. $NaCl \xrightarrow{H_2O} Na^+(aq) + Cl^-(aq)$

35 g NaCl in 350 mL soln

a. $(35\text{ g NaCl})\left(\frac{1\text{ mol}}{58.44\text{ g}}\right) = .598\text{ mol NaCl}$

b. $\frac{.598\text{ mol NaCl}}{.35\text{ L SOLN}} = 1.7\text{ M NaCl}$

c. $\frac{(.598\text{ mol } Na^+)}{.35\text{ L SOLN}} = 1.7\text{ M } Na^+(aq)$ — FROM 1:1:1 MOLE RATIO IN BALANCED EQTN

5. $Ca(NO_3)_2 \xrightarrow{H_2O} Ca^{2+} + 2\,NO_3^-$

3 mol $Ca(NO_3)_2$ in 3C SOLN

a. $\left(\frac{3\text{ mol}}{1}\right)\left(\frac{164.1\text{ g}}{\text{mol}}\right) = 820.5\text{ g } Ca(NO_3)_2$

b. $(3\text{ mol } Ca(NO_3)_2)\left(\frac{2\text{ mol } NO_3}{1\text{ mol } Ca(NO_3)_2}\right) = 10\text{ mol } NO_3^-$

c. $\frac{(10\text{ mol } NO_3^-)}{3\text{ L SOLN}} = 3.33\text{ M } NO_3^-$

6. $(NH_4)_2SO_4 \longrightarrow 2\,NH_4^+(aq) + SO_4^{2-}(aq)$

250 mL of a 1.5 M SOLN

a. NH_4^+ & SO_4^{2-}

b. $(1.5\frac{\text{mol}}{\text{L}})(.25\text{ L}) = .375\text{ mol } (NH_4)_2SO_4$

c. .25 L SOLN

BUFF

7. $NH_4Cl + NaCl \xrightarrow{H_2O} NH_4^+_{(aq)} + Na^+_{(aq)} + 2\,Cl^-_{(aq)}$

4.0 mol 2.1 mol in 10 L soln

= 4 mol NH_4^+ in 10 L = **.4 M NH_4^+**

= 2.1 mol Na^+ in 10 L = **.21 M Na^+**

= 4 mol Cl^- + 2.1 mol Cl^- in 10 L

= .61 M Cl^-

8. $CaBr_2 + MgBr_2 \rightarrow Ca^{2+} + Mg^{2+} + 4\,Br^-$

.3 mol .4 mol in 1 L soln

= .3 mol Ca^{2+} in 1 L = **.3 M Ca^{2+}**

= .4 mol Mg^{2+} in 1 L = **.4 M Mg^{2+}**

$= (.3 \text{ mol } CaBr_2)\left(\frac{2 \text{ mol } Br^-}{\text{mol } CaBr_2}\right) = .6 \text{ mol } Br^- \text{ from } CaBr_2$

$(.4 \text{ mol } MgBr_2)\left(\frac{2 \text{ mol } Br^-}{\text{mol } MgBr_2}\right) = .8 \text{ mol } Br^- \text{ from } MgBr_2$

1.4 mol Br^-

1.4 mol Br^- in 1 L = **1.4 M Br^-**

9. $NaOH + Na_2SO_4 \rightarrow 3\,Na^+ + OH^- + SO_4^{2-}$

$\frac{(30 \text{ g NaOH})}{40 \text{ g/mol}} = .75 \text{ mol NaOH}$ $\frac{(40 \text{ g } Na_2SO_4)}{(142.04 \text{ g/mol})} = .28 \text{ mol } Na_2SO_4$

$= (.28 \text{ mol } Na_2SO_4)\left(\frac{2 \text{ mol Na}}{1 \text{ mol } Na_2SO_4}\right) = .56 \text{ mol Na from } Na_2SO_4$

$= (.75 \text{ mol NaOH})\left(\frac{1 \text{ mol Na}}{1 \text{ mol NaOH}}\right) = .75 \text{ mol Na from NaOH}$

1.31 mol Na TOTAL

9. continued

$(.75 \text{ mol } NaOH)\left(\frac{1 \text{ mol } OH^-}{1 \text{ mol } NaOH}\right) = .75 \text{ mol } OH^- \text{ in } 1L$

$= .75 M\ OH^-$

$(.28 \text{ mol } Na_2SO_4)\left(\frac{1 \text{ mol } SO_4^{2-}}{1 \text{ mol } Na_2SO_4}\right) = .28 \text{ mol } SO_4^{2-} \text{ in } 1L$

$= .28 M\ SO_4^{2-}$

10. $C_{12}H_{22}O_{11} + NaCl \xrightarrow{H_2O} Na^+ + Cl^- + C_{12}H_{22}O_{11}$

$\frac{100 g\ C_{12}H_{22}O_{11}}{342 g/mol} = .292 \text{ mol } C_{12}H_{22}O_{11}$

$\frac{2 \text{ mol}}{.3 L} = 6.67 M\ NaCl$

$= 6.67 M\ Na^+$

$= 6.67 M\ Cl^-$

$= \frac{.292 \text{ mol}}{.3 L} C_{12}H_{22}O_{11} = .97 M\ C_{12}H_{22}O_{11}$