Chemistry 11

Solution Review

Name: Key
Date:
Block:

1. What mass of H_3PO_4 is contained in 83.5 mL of a 6.15 M solution?

$$83.5\,mL \times \frac{1\,L}{1000\,mL} \times \frac{6.15\,mol\,H_3PO_4}{1\,L} \times \frac{98.00\,g}{1\,mol} = 50.3\,g\,H_3PO_4$$

2. If 9.0 mL of 4.00 M HNO_3 solution is diluted to a volume of 600.0 mL, what will be the molarity of the diluted solution?

$C_1 = 4.00\,M$
$V_1 = 9.0\,mL$
$V_2 = 600.0\,mL$
$C_2 = ?$

$C_1V_1 = C_2V_2$
$(4.00)(9.0) = C_2(600.0)$
$C_2 = 0.060\,M\ HNO_3$

3. What initial volume of 6.0 M hydrochloric acid is required to make 2.00 L of 0.500 M hydrochloric acid solution?

$C_1 = 6.0\,M$
$V_1 = ?$
$C_2 = 0.500\,M$
$V_2 = 2.00\,L$

$C_1V_1 = C_2V_2$
$(6.0)V_1 = (0.500)(2.00)$
$V_1 = 0.17\,L$
$= 170\,mL\ HCl$

4. How much water must be added to a 35.0 mL sample of 10.0 M HCl to give a resulting concentration of 0.350 M?

$V_1 = 35.0\,mL$
$C_1 = 10.0\,M$
$C_2 = 0.350\,M$
$V_2 = ?$

$C_1V_1 = C_2V_2$
$(10.0)(35.0) = (0.350)V_2$
$V_2 = 1000\,mL = 1.00\,L$

$35.0\,mL \times \frac{1\,L}{1000\,mL} = 0.0350\,L$

$1.00\,L - 0.0350\,L = 0.97\,L\ H_2O$

5. Write the balanced ionization equation for the following solutes in water:
   a. Na_2CO_3

$$Na_2CO_{3(aq)} \rightarrow 2Na^+_{(aq)} + CO_3^{2-}{}_{(aq)}$$

   b. $MgSO_4$

$$MgSO_{4(aq)} \rightarrow Mg^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$$

   c. Barium nitrate

$$Ba(NO_3)_{2(aq)} \rightarrow Ba^{2+}_{(aq)} + 2NO_3^-{}_{(aq)}$$

6. 250.0 mL of 0.60 M HCl is added to 300.0 mL of 1.0 M HBr. What is the final concentration of each ion in solution?

[HCl] $C_1V_1 = C_2V_2$

$(0.60)(250.0) = C_2(550.0)$

$C_2 = 0.27\,M$

$HCl \rightarrow H^+ + Cl^-$

$0.27\,M \quad 0.27\,M \quad 0.27\,M$

[HBr] $C_1V_1 = C_2V_2$

$(1.0)(300.0) = C_2(550.0)$

$C_2 = 0.55\,M$

$HBr \rightarrow H^+ + Br^-$

$0.55\,M \quad 0.55\,M \quad 0.55\,M$

$[H^+] = 0.27\,M + 0.55\,M = 0.82\,M$

$[Cl^-] = 0.27\,M$

$[Br^-] = 0.55\,M$

7. Write a formula equation, complete ionic equation and net ionic equation for the following reactions:
   a. Magnesium sulphide and zinc chloride

$MgS_{(aq)} + ZnCl_{2(aq)} \rightarrow MgCl_{2(aq)} + ZnS_{(s)}$

$Mg^{2+}_{(aq)} + S^{2-}_{(aq)} + Zn^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow Mg^{2+}_{(aq)} + 2Cl^-_{(aq)} + ZnS_{(s)}$

$S^{2-}_{(aq)} + Zn^{2+}_{(aq)} \rightarrow ZnS_{(s)}$

   b. Sodium carbonate and barium sulphide

$Na_2CO_{3(aq)} + BaS_{(aq)} \rightarrow BaCO_{3(s)} + Na_2S_{(aq)}$

$2Na^+_{(aq)} + CO_3^{-2}{}_{(aq)} + Ba^{2+}_{(aq)} + S^{2-}_{(aq)} \rightarrow BaCO_{3(s)} + 2Na^+_{(aq)} + S^{2-}_{(aq)}$

$CO_3^{-2}{}_{(aq)} + Ba^{2+}_{(aq)} \rightarrow BaCO_{3(s)}$

c. $H_2SO_{3\,(aq)}$ and $CaCl_{2\,(aq)}$

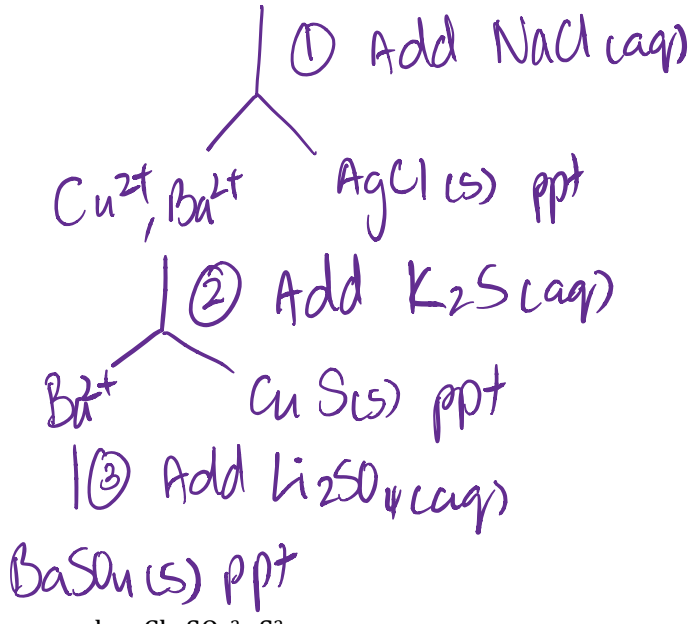
$H_2SO_{3(aq)} + CaCl_{2(aq)} \rightarrow 2HCl_{(aq)} + CaSO_{3(s)}$

$2H^+_{(aq)} + SO_3^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow 2H^+_{(aq)} + 2Cl^-_{(aq)} + CaSO_{3(s)}$

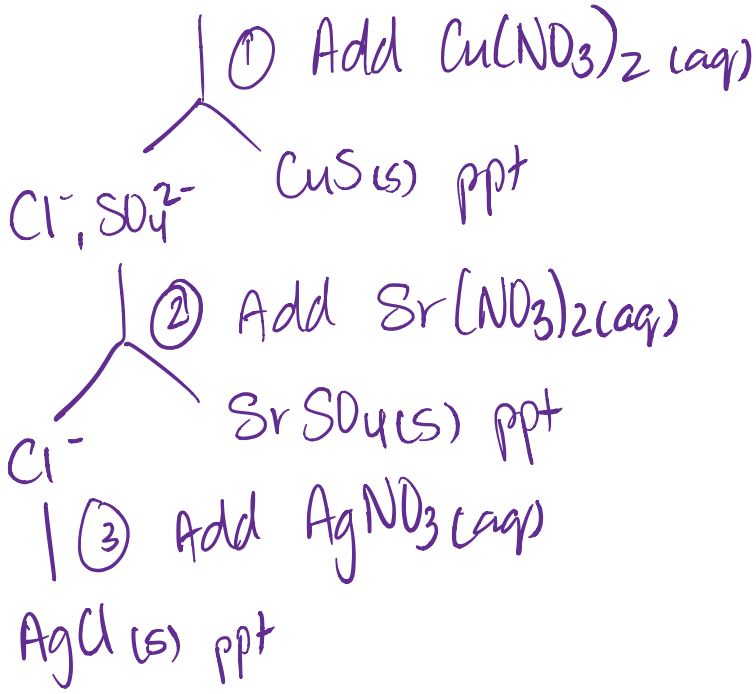
$SO_3^{2-}{}_{(aq)} + Ca^{2+}_{(aq)} \rightarrow CaSO_{3(s)}$

8. A solution contains the following ions. Using a flow chart, show what compounds could be added and in what order to separate these ions.

a. Cu^{2+}, Ba^{2+} and Ag^+.



b. Cl^-, SO_4^{2-}, S^{2-}



9. Consider the following results from a titration lab.

3.00 g of NaOH was dissolved to make a 100. mL solution
Below is the volume of the NaOH solution needed to neutralize 10.0 mL H_2SO_4

	Trial #1	**Trial #2**	**Trial #3**
Initial reading of burette (mL)	0.00	12.44	24.94
Final reading of burette (mL)	12.44	24.94	37.36
	12.44 mL	12.50 mL	12.42 mL

a. What is the balanced chemical reaction?

$$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$$

b. What is the concentration of the standardized solution of NaOH?

$$\frac{3.00\text{g NaOH}}{100.\text{mL}} \times \frac{1000\text{mL}}{1\text{L}} \times \frac{1\text{mol NaOH}}{40.00\text{g}} = \boxed{0.750\text{M NaOH}}$$

c. What was the average volume of NaOH was needed?

$$\frac{12.44\text{mL} + 12.50\text{mL} + 12.42\text{mL}}{3} = \boxed{12.45\text{mL NaOH}}$$

d. What is the concentration of the acid?

$$12.45\text{mL NaOH} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{0.750\text{mol NaOH}}{1\text{L}} \times \frac{1\text{mol } H_2SO_4}{2\text{mol NaOH}}$$

$$= 0.00467\text{ mol } H_2SO_4$$

$$\frac{0.00467\text{mol } H_2SO_4}{10.0\text{mL}} \times \frac{1000\text{mL}}{1\text{L}} = \boxed{0.467\text{M } H_2SO_4}$$