CHM151 Quiz #4a 25 Pts Spring 2006 Name: Key

**Molar Masses: Na 22.99, K 39.10, S 32.07, O 16.00, Cl 35.45, H 1.008**

1. (4 Pts) How many grams of $Na_2SO_4$ are needed to prepare 350.0 mL of 0.10 M solution?

$$\frac{350.0\ \text{mL}}{1000\ \text{mL}} \left| \frac{0.10\ \text{mol}\ Na_2SO_4}{1\ \text{L}} \right| \frac{142.05\ \text{g}}{\text{mol}} = 4.97\ \text{g}\ Na_2SO_4$$

"Shortcut"

2. (4 Pts) Complete and balance the following reactions:

a. $2\,H_3PO_4 + 3\,Ba(OH)_2 \rightarrow 6\,H_2O + Ba_3(PO_4)_2$

b. $3HCl + Al(OH)_3 \rightarrow 3\,H_2O + AlCl_3$

3. (4 Pts) How many mL of 0.50 M HCl solution are needed to prepare 400 mL of 0.15 M HCl solution?

$M_1 = 0.50\ M \quad M_2 = 0.15\ M \quad M_1V_1 = M_2V_2$

$V_1 = ?\ \text{mL} \quad V_2 = 400\ \text{mL} \quad V_1 = \frac{M_2V_2}{M_1} = \frac{(0.15\ M)(400\ \text{mL})}{0.50\ M} = 120\ \text{mL}$

4. (7 Pts) It took 36.25 mL of 0.2308 M NaOH solution to neutralize 25.00 mL of sulfuric acid solution. Determine the Molarity of the sulfuric acid solution.

$2NaOH(aq) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$

36.25 mL | 25.00 mL

0.2308 mol/L | ? mol/L (M)

☺

$$25.00\times10^{-3}\ \text{L}\ H_2SO_4 \left| \frac{36.25\ \text{mL NaOH}}{} \right| \frac{0.2308\ \text{mol NaOH}}{1000\ \text{mL NaOH}} \left| \frac{1\ \text{mol}\ H_2SO_4}{2\ \text{mol NaOH}} \right| = 0.16733 \frac{\text{mol}\ H_2SO_4}{\text{L}\ H_2SO_4}$$

5. (6 Pts) How many grams of NaOH are needed to neutralize 200 mL of 2.00 M $H_2SO_4$ solution?

$2NaOH(s) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$

? g | 200 mL | 2.00 mol/L

$$200\ \text{mL}\ H_2SO_4 \left| \frac{2.00\ \text{mol}\ H_2SO_4}{1000\ \text{mL}\ H_2SO_4} \right| \frac{2\ \text{mol NaOH}}{1\ \text{mol}\ H_2SO_4} \left| \frac{40.00\ \text{g NaOH}}{\text{mol NaOH}} \right| = 32.0\ \text{g NaOH}$$

CHM151 Quiz #4b 25 Pts Spring 2006 Name: Key

**Molar Masses: Na 22.99, K 39.10, S 32.07, O 16.00, Cl 35.45, H 1.008**

1. (4 Pts) Complete and balance the following reactions:

a. $Ca(OH)_2 + 2HNO_3 \rightarrow 2H_2O + Ca(NO_3)_2$

b. $2H_3PO_4 + 3Ba(OH)_2 \rightarrow 6H_2O + Ba_3(PO_4)_2$

2. (4 Pts) How many grams of $K_2SO_4$ are needed to prepare 350.0 mL of 0.10 M solution?

$$\frac{350.0\ \text{mL}}{1}\left|\frac{0.10\ \text{mol}\ K_2SO_4}{1000\ \text{mL}}\right|\frac{174.27\ \text{g}}{1\ \text{mol}} = 6.099$$

"shortcut"

6.1 g $K_2SO_4$

3. (7 Pts) It took 36.25 mL of 0.2308 M NaOH solution to neutralize 45.00 mL of sulfuric acid solution. Determine the molarity of the sulfuric acid solution.

$2NaOH(aq) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$

36.25 mL, 0.2308 mol/L (M) | 45.00 mL, ? mol/L (M)

☺

$$\frac{36.25\ \text{mL NaOH}}{45.00\times10^{-3}\ \text{L}\ H_2SO_4}\left|\frac{0.2308\ \text{mmol NaOH}}{1000\ \text{mL NaOH}}\right|\frac{1\ \text{mol}\ H_2SO_4}{2\ \text{mol NaOH}} = 0.09296\ \frac{\text{mol}\ H_2SO_4}{\text{L}\ H_2SO_4}$$

4. (4 Pts) How many mL of 0.60 M HCl solution are needed to prepare 400 mL of 0.15 M HCl solution?

$M_1 = 0.60\text{M}$, $V_1 = ?\ \text{mL}$, $M_2 = 0.15\text{M}$, $V_2 = 400\ \text{mL}$

$M_1V_1 = M_2V_2$

$$V_1 = \frac{M_2V_2}{M_1} = \frac{(0.15\text{M})(400\ \text{mL})}{0.60\text{M}} = 100\ \text{mL}$$

5. (6 Pts) How many grams of NaOH are needed to neutralize 200 mL of 2.00 M $H_2SO_4$ solution?

$2NaOH(s) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$

? g | 200 mL, 2.00 mol/L (M)

$$\frac{200\ \text{mL}\ H_2SO_4}{1}\left|\frac{2.00\ \text{mol}\ H_2SO_4}{1000\ \text{mL}\ H_2SO_4}\right|\frac{2\ \text{mol NaOH}}{1\ \text{mol}\ H_2SO_4}\left|\frac{40.00\ \text{g NaOH}}{1\ \text{mol NaOH}}\right| = 32.0\ \text{g NaOH}$$