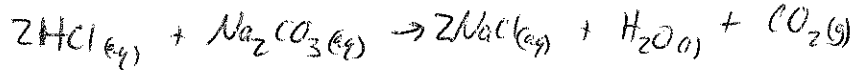


Key

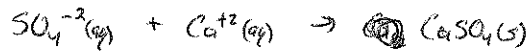
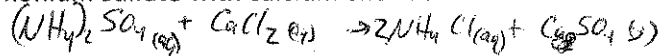
## Solution Problems Review

1. Determine if the following reactions will occur between the given compounds. If they will, write out the complete balanced chemical equation (with state of matter denotations). Also write out the net ionic equation for each reaction that occurs.

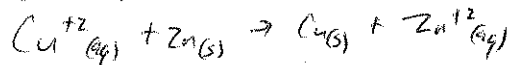
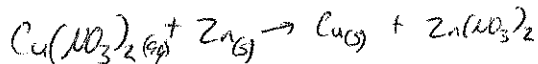
a. hydrochloric acid with sodium carbonate



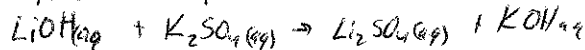
b. ammonium sulfate with calcium chloride



c. copper (II) nitrate with zinc

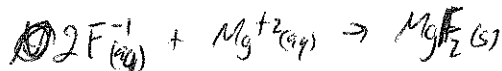
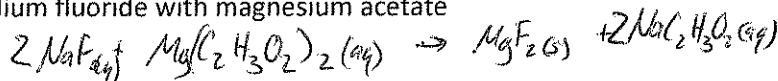


d. lithium hydroxide with potassium sulfate

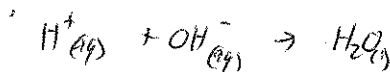


No Reaction

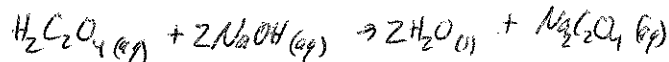
e. sodium fluoride with magnesium acetate



f. potassium hydroxide with nitric acid



2. What volume of 0.125 M oxalic acid,  $\text{H}_2\text{C}_2\text{O}_4$ , is required to react with 35.2 mL of 0.546 M NaOH?



$$0.546 \text{ M NaOH} = \frac{X}{0.0352 \text{ L}}$$

$$X = \frac{0.0192 \text{ mol NaOH} \left| \frac{1 \text{ mol H}_2\text{C}_2\text{O}_4}{2 \text{ mol NaOH}} \right.}{2 \text{ mol NaOH}} = 9.61 \times 10^{-3} \text{ mol H}_2\text{C}_2\text{O}_4$$

$$0.125 \text{ M H}_2\text{C}_2\text{O}_4 = \frac{9.61 \times 10^{-3} \text{ mol}}{V}$$

$$V = 0.0769 \text{ L} = 76.9 \text{ mL}$$

3. If you dilute 25 mL of 1.5 M hydrochloric acid to 500 mL, what is the molar concentration of the dilute acid?

$$M_1 V_1 = M_2 V_2$$

$$1.5(25) = M_2(500)$$

$$M_2 = 0.075 \text{ M HCl}$$

4. Describe how you would make 250 mL of 0.4 M sodium hydroxide if you have anhydrous sodium hydroxide and distilled water.

~~$$0.4 \text{ M NaOH} = \frac{x}{250 \text{ L}}$$~~

$$0.4 \text{ M NaOH} = \frac{x}{250 \text{ L}}$$

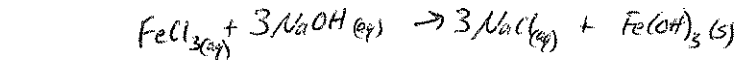
Dissolve 4g NaOH in water  
then dilute to 250 mL

$$x = \frac{1 \text{ mol NaOH} / 40 \text{ g NaOH}}{1 \text{ mol NaOH}} = 4 \text{ g NaOH}$$

5. You mix 25 mL of 0.234 M Iron (III) chloride with 42.5 mL of 0.453 M NaOH.

a. What mass of iron (III) hydroxide precipitates?  $0.625 \text{ g Fe(OH)}_3$

b. What will be the molar concentration of the excess reactant remaining in solution after the maximum mass of iron(III) hydroxide has formed?



$$0.234 = \frac{x}{0.25 \text{ L}}$$

$$x = 5.85 \times 10^{-3} \text{ mol FeCl}_3 \quad \text{LR}$$

$$\frac{3 \text{ mol NaOH}}{1 \text{ mol FeCl}_3} = 0.0176 \text{ mol NaOH}$$

$$0.453 \text{ M NaOH} = \frac{x}{0.0425}$$

$$x = 0.0193 \text{ mol NaOH}$$

b.) started with 0.0193 mol NaOH  
used - 0.0176 mol NaOH

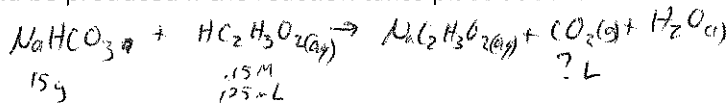
0.0017 mol NaOH remain

$$M = \frac{0.0017 \text{ mol}}{(0.025 \text{ L} + 0.0425 \text{ L})} = 0.025 \text{ M NaOH}$$

$$\frac{5.85 \times 10^{-3} \text{ mol FeCl}_3}{1 \text{ mol FeCl}_3} \times \frac{1 \text{ mol Fe(OH)}_3}{1 \text{ mol FeCl}_3} \times 106.8 \text{ g Fe(OH)}_3 = 0.625 \text{ g Fe(OH)}_3$$

6. Sodium bicarbonate and acetic acid react to form sodium acetate, carbon dioxide, and water.

Suppose you add 15 g of sodium bicarbonate to 125 mL of 0.15 M acetic acid. What volume of carbon dioxide would be produced if the reaction takes place at STP?



$$\frac{15 \text{ g NaHCO}_3}{84 \text{ g NaHCO}_3} \times \frac{1 \text{ mol NaHCO}_3}{1 \text{ mol NaHCO}_3} = 0.179 \text{ mol NaHCO}_3$$

$$\frac{0.188 \text{ mol HC}_2\text{H}_3\text{O}_2}{1 \text{ mol HC}_2\text{H}_3\text{O}_2} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol HC}_2\text{H}_3\text{O}_2} = 0.188 \text{ mol CO}_2$$

$$0.15 \text{ M} = \frac{x}{0.125 \text{ L}}$$

$$x = 0.0188 \text{ mol HC}_2\text{H}_3\text{O}_2$$

$$0.188 \text{ mol CO}_2 \times 22.4 \text{ L/mol} = 4.21 \text{ L CO}_2$$