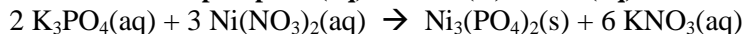
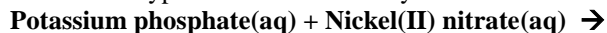


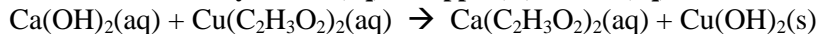
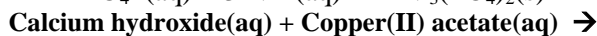
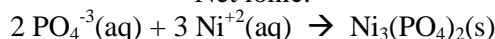
## CHEM 150 – Fall 2013 – Bodwin – Reactions and Stoichiometry

1. For each of the following, identify the reaction type and write a correctly balanced chemical equation.



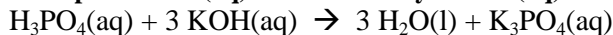
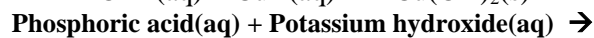
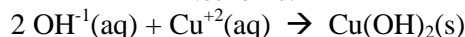
Metathesis/Exchange reaction, Precipitation reaction

Net ionic:



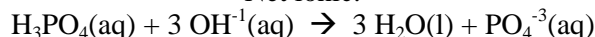
Metathesis/Exchange reaction, Precipitation reaction

Net ionic:



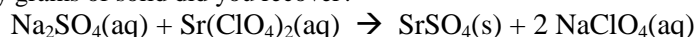
Metathesis/exchange reaction, Acid-base reaction, Molecule-forming reaction

Net ionic:



{Phosphoric acid is a weak acid, so it does not completely dissociate when looking at a net ionic equation.}

2. You have combined 30.00mL of 2.637M sodium sulfate solution with 35.00mL of 2.516M strontium perchlorate solution. (strontium atomic# = 38) When you do this reaction, you find that you have achieved 82.738% yield. What is the solid produced by this reaction and how many grams of solid did you recover?



Strontium sulfate is the precipitate that forms in this reaction.

$$(0.03000\text{LNa}_2\text{SO}_4(\text{aq})) \left( \frac{2.637\text{molNa}_2\text{SO}_4}{1\text{LNa}_2\text{SO}_4(\text{aq})} \right) \left( \frac{1\text{molSrSO}_4}{1\text{molNa}_2\text{SO}_4} \right) \left( \frac{183.682\text{gSrSO}_4}{1\text{molSrSO}_4} \right) = 14.53\text{gSrSO}_4(\text{s})$$

$$(0.03500\text{LSr}(\text{ClO}_4)_2(\text{aq})) \left( \frac{2.516\text{molSr}(\text{ClO}_4)_2}{1\text{LSr}(\text{ClO}_4)_2(\text{aq})} \right) \left( \frac{1\text{molSrSO}_4}{1\text{molSr}(\text{ClO}_4)_2} \right) \left( \frac{183.682\text{gSrSO}_4}{1\text{molSrSO}_4} \right) = 16.18\text{gSrSO}_4(\text{s})$$

Since the  $\text{Na}_2\text{SO}_4(\text{aq})$  added to the reaction produces less product than the  $\text{Sr}(\text{ClO}_4)_2(\text{aq})$  added to the reaction, sodium sulfate is the limiting reactant and the theoretical yield of the reaction is 14.53g strontium sulfate.

$$(14.53\text{g})(0.82738) = 12.02\text{g actual yield}$$

3. You have added 50.00mL of 1.384M hydrochloric acid to 3.918g of solid calcium carbonate. If the gas that is formed in this reaction is collected in a 750.0mL container at 38.27°C, what is the pressure of the collected gas? (Assume the 750.0mL container contains only the gas generated by this experiment.)



Carbonic acid is one of the “gas-forming reaction” substances we identified, it spontaneously decomposes to carbon dioxide and water. How much carbon dioxide is formed?

$$(0.05000\text{LHCl}(\text{aq})) \left( \frac{1.384\text{molHCl}}{1\text{LHCl}(\text{aq})} \right) \left( \frac{1\text{molCO}_2}{2\text{molHCl}} \right) \left( \frac{(0.08206\frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(273.15 + 38.27\text{K})}{0.7500\text{L}} \right) = 1.179\text{atm}$$

$$(3.918\text{gCaCO}_3(\text{s})) \left( \frac{1\text{molCaCO}_3}{100.086\text{gCaCO}_3} \right) \left( \frac{1\text{molCO}_2}{1\text{molCaCO}_3} \right) \left( \frac{(0.08206\frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(273.15 + 38.27\text{K})}{0.7500\text{L}} \right) = 1.334\text{atm}$$

HCl(aq) is the limiting reagent, the pressure of the gas would be 1.179atm.