

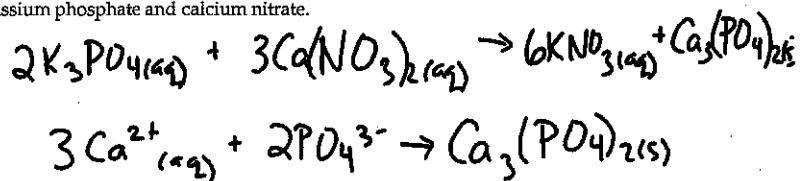
4.5

Precipitate Reactions and Selective Precipitation Assignment

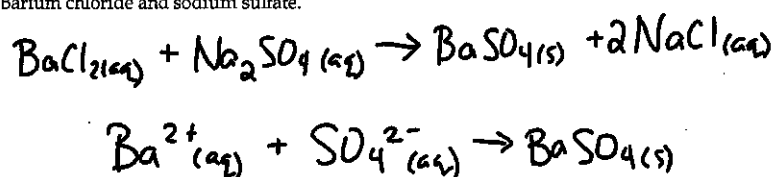
Part A: Net Ionic Equations

Write the balanced and net-ionic equation for the following double replacement reactions. Note that all reactants are aqueous. All states must be shown. If a reaction does not occur you must indicate that and a balanced equation is not necessary.

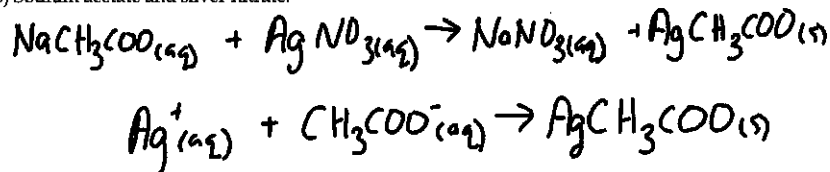
1) Potassium phosphate and calcium nitrate.



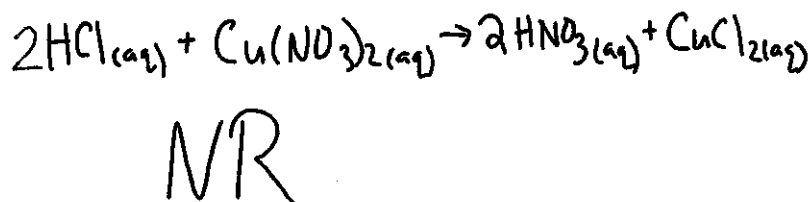
2) Barium chloride and sodium sulfate.



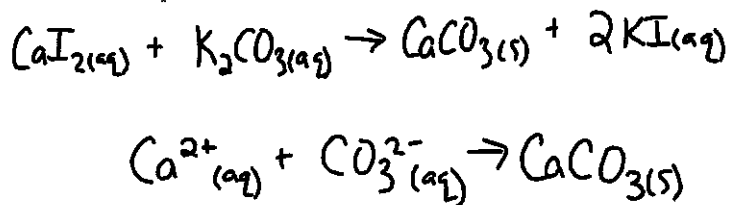
3) Sodium acetate and silver nitrate.



4) Hydrochloric acid and copper (II) nitrate



5) Calcium iodide and potassium carbonate.



Part B Selective Precipitation

1. An aqueous solution containing the following cations: Ca^{2+} Ag^+ Cu^{2+} K^+

In order to separate them, the following solutions are available: Na_2S Na_2CO_3 NaBr

If we wish to separate the cations by causing only one cation to precipitate out of solution at a time:

- in what order should the solutions Na_2S , Na_2CO_3 , and NaBr be added?
- identify the three precipitates that form after the addition of those solutions.
- which one cation will remain in solution?

	Ca^{2+}	Ag^+	Cu^{2+}	K^+	
S^{2-}	Sol	PPT	PPT	Sol	① $\text{NaBr} \rightarrow \text{AgBr}(s)$
CO_3^{2-}	PPT	PPT	PPT	Sol	② $\text{Na}_2\text{S} \rightarrow \text{CuS}(s)$
Br^-	Sol	PPT	Sol	Sol	③ $\text{Na}_2\text{CO}_3 \rightarrow \text{CaCO}_3(s)$

c) K^+ is the only ion left in solution

2. We wish to separate the cations from a mixture containing the following solutions:

$\text{Ba}(\text{NO}_3)_2$, $\text{Mg}(\text{NO}_3)_2$, and AgNO_3

In order to do so we are given the following separate solutions: K_2SO_4 , K_2S , and KOH

In what order should we add the separate solutions in order to remove the cations by selective precipitation? List the precipitates that form, in the proper order.

	Ba^{2+}	Mg^{2+}	Ag^+	
SO_4^{2-}	PPT	Sol	PPT	① $\text{K}_2\text{S} \rightarrow \text{Ag}_2\text{S}(s)$
S^{2-}	Sol	Sol	PPT	② $\text{KOH} \rightarrow \text{Mg}(\text{OH})_2(s)$
OH^-	Sol	PPT	PPT	③ $\text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4(s)$

(can be)

3. You want to separate the following cations from a solution: Be^{2+} , Sr^{2+} , and Ag^+ . If you are given NH_4Br , Na_2SO_3 , and H_2SO_4 , list the order the substances must be added and the precipitates that form in each step.

	Be^{2+}	Sr^{2+}	Ag^+	
Br^-	Sol	Sol	PPT	① $\text{NH}_4\text{Br} \rightarrow \text{AgBr}(s)$
SO_3^{2-}	PPT	PPT	PPT	② $\text{H}_2\text{SO}_4 \rightarrow \text{SrSO}_4(s)$
SO_4^{2-}	Sol	PPT	PPT	③ $\text{Na}_2\text{SO}_3 \rightarrow \text{BeSO}_3(s)$

4. An aqueous solution contains a mixture of Ba^{2+} , Pb^{2+} and Ca^{2+} . List 3 substances that can be added in the correct order such that 1 cation will precipitate out at a time. List the precipitate that forms in each step.

	Ba^{2+}	Pb^{2+}	Ca^{2+}	order	precip
Br^-	Sol	PPT	Sol	① NaBr	$\text{PbBr}_2(s)$
SO_4^{2-}	PPT	PPT	PPT	② NaOH	$\text{Ca}(\text{OH})_2(s)$
OH^-	Sol	PPT	PPT	③ Na_2SO_4	$\text{BaSO}_4(s)$

Answers will vary, but as an example.