

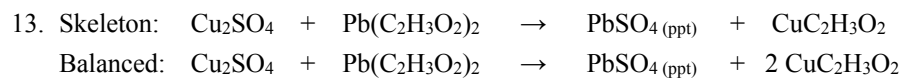
- Assume that all of the reactant compounds (salts) below are put into water, if solution is not already stated.
- First write out the product in words, then use the solubility chart to determine if a reaction *can* occur.  
(Remember, for a precipitation-type reaction to occur, both reactants must be soluble AND then one (or both) of the products must be insoluble. If all products are soluble, no reaction occurs.)
- If a precipitation type reaction does **not** occur be sure to state why it does not occur.
- If a reaction does occur, predict the products, and write a skeleton equation, then balance.  
Identify any precipitates with <sub>(s)</sub> or <sub>(ppt)</sub> symbol. (You may leave the <sub>(aq)</sub> off.)
- If a reaction does occur, rewrite the “molecular” equation as a net ionic equation. Because spectator ions are not written, you may be able to reduce the coefficients and simplify the balancing.

1. lead(II) nitrate is combined with aluminum chloride
2. sodium phosphate is combined with strontium chloride
3. sodium hydroxide solution is combined with *strong* hydrochloric acid solution.
4. lithium hydroxide solution is combined with *weak* phosphoric acid solution.
5. calcium carbonate is combined with copper(II) sulfate
6. calcium iodide is combined with silver chlorate
7. nickel(II) chloride is combined with potassium ferrocyanide
8. a solution of barium hydroxide is combined with *strong* hydrochloric acid solution.
9. ammonium carbonate is combined with copper(I) sulfate
10. sodium hydroxide solution is combined with *weak* acetic acid solution

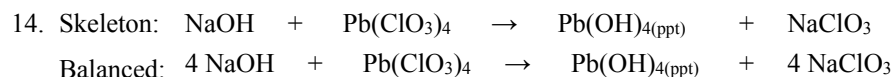
### P H3 (pg 2 of 4) Double Replacement (Acid Base & Precipitation)

11. ammonium sulfate is combined with magnesium phosphate
12. strontium hydroxide solution is combined with *strong* nitric acid solution.
13. copper(I) sulfate is combined with lead(II) acetate
14. sodium hydroxide is combined with lead(IV) chlorate
15. tin(II) chromate is combined with sodium nitrate
16. potassium chlorate is combined with copper(II) bromide
17. potassium hydroxide solution is combined with *strong* sulfuric acid
18. a solution of calcium hydroxide is combined with *weak carbonic* acid solution
19. ammonium phosphate is combined with zinc chloride
20. calcium chloride is combined with mercury(I) chlorate
21. silver nitrate is combined with sodium bromide

- Skeleton:  $\text{Pb}(\text{NO}_3)_2 + \text{AlCl}_3 \rightarrow \text{PbCl}_{2(\text{ppt})} + \text{Al}(\text{NO}_3)_3$   
 Balanced:  $3 \text{Pb}(\text{NO}_3)_2 + 2 \text{AlCl}_3 \rightarrow 3 \text{PbCl}_{2(\text{ppt})} + 2 \text{Al}(\text{NO}_3)_3$   
 formation of a precipitate  $\therefore$  a reaction occurs.  
 Net ionic equation:  $\text{Pb}^{2+} + 2 \text{Cl}^- \rightarrow \text{PbCl}_2$
- Skeleton:  $\text{Na}_3\text{PO}_4 + \text{SrCl}_2 \rightarrow \text{Sr}_3(\text{PO}_4)_2(\text{ppt}) + \text{NaCl}$   
 Balanced:  $2 \text{Na}_3\text{PO}_4 + 3 \text{SrCl}_2 \rightarrow \text{Sr}_3(\text{PO}_4)_2(\text{ppt}) + 6 \text{NaCl}$   
 formation of a precipitate  $\therefore$  a reaction occurs.  
 Net ionic equation:  $2 \text{PO}_4^{3-} + 3 \text{Sr}^{2+} \rightarrow \text{Sr}_3(\text{PO}_4)_2$
- Skeleton:  $\text{NaOH}_{(\text{aq})} + \text{HCl}_{(\text{aq})} \rightarrow \text{NaCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{L})}$   
 Balanced: already balanced  
 Net Ionic:  $\text{OH}^-_{(\text{aq})} + \text{H}^+_{(\text{aq})} \rightarrow \text{H}_2\text{O}_{(\text{L})}$
- Skeleton:  $\text{LiOH}_{(\text{aq})} + \text{H}_3\text{PO}_{4(\text{aq})} \rightarrow \text{Li}_3\text{PO}_{4(\text{aq})} + \text{H}_2\text{O}_{(\text{L})}$   
 Balanced:  $3 \text{LiOH}_{(\text{aq})} + \text{H}_3\text{PO}_{4(\text{aq})} \rightarrow \text{Li}_3\text{PO}_{4(\text{aq})} + 3 \text{H}_2\text{O}_{(\text{L})}$   
 Net Ionic:  $3 \text{OH}^-_{(\text{aq})} + \text{H}_3\text{PO}_{4(\text{aq})} \rightarrow 3 \text{H}_2\text{O}_{(\text{L})} + \text{PO}_4^{3-}$   
*(since phosphoric acid is weak, it should be represented as a molecule, not as separated ions)*
- Calcium carbonate reactant is not soluble  $\therefore$  no reaction can occur.
- Skeleton:  $\text{CaI}_2 + \text{AgClO}_3 \rightarrow \text{AgI}_{(\text{ppt})} + \text{Ca}(\text{ClO}_3)_2$   
 Balanced:  $\text{CaI}_2 + 2 \text{AgClO}_3 \rightarrow 2 \text{AgI}_{(\text{ppt})} + \text{Ca}(\text{ClO}_3)_2$   
 formation of a precipitate  $\therefore$  a reaction occurs.  
 Net ionic equation:  $\text{Ag}^+ + \text{I}^- \rightarrow \text{AgI}$
- $2\text{NiCl}_2 + \text{K}_4\text{Fe}(\text{CN})_6 \rightarrow 4\text{KCl} + \text{Ni}_2\text{Fe}(\text{CN})_{6(\text{ppt})}$   
 formation of a precipitate  $\therefore$  a reaction occurs.  
 Net ionic equation:  $2 \text{Ni}^{2+} + \text{Fe}(\text{CN})_6^{4-} \rightarrow \text{Ni}_2\text{Fe}(\text{CN})_6$
- You are told a solution of barium hydroxide, so you can assume the  $\text{Ba}(\text{OH})_2$  is dissolved.  
 Skeleton:  $\text{Ba}(\text{OH})_{2(\text{aq})} + \text{HCl}_{(\text{aq})} \rightarrow \text{BaCl}_{2(\text{aq})} + \text{H}_2\text{O}_{(\text{L})}$   
 Balanced:  $\text{Ba}(\text{OH})_{2(\text{aq})} + 2 \text{HCl}_{(\text{aq})} \rightarrow \text{BaCl}_2 + 2 \text{H}_2\text{O}_{(\text{L})}$   
 Net Ionic:  $2 \text{OH}^-_{(\text{aq})} + 2 \text{H}^+_{(\text{aq})} \rightarrow 2 \text{H}_2\text{O}_{(\text{L})}$  can be reduced:  $\text{OH}^-_{(\text{aq})} + \text{H}^+_{(\text{aq})} \rightarrow \text{H}_2\text{O}_{(\text{L})}$
- Skeleton:  $(\text{NH}_4)_2\text{CO}_3 + \text{Cu}_2\text{SO}_4 \rightarrow \text{Cu}_2\text{CO}_3(\text{ppt}) + (\text{NH}_4)_2\text{SO}_4$   
 Balanced: already balanced  
 formation of a precipitate  $\therefore$  a reaction occurs.  
 Net ionic equation:  $\text{CO}_3^{2-} + 2 \text{Cu}^+ \rightarrow \text{Cu}_2\text{CO}_3$
- Skeleton:  $\text{NaOH}_{(\text{aq})} + \text{HC}_2\text{H}_3\text{O}_{2(\text{aq})} \rightarrow \text{NaC}_2\text{H}_3\text{O}_{2(\text{aq})} + \text{H}_2\text{O}_{(\text{L})}$   
 Balanced: already balanced  
 Net Ionic:  $\text{OH}^-_{(\text{aq})} + \text{HC}_2\text{H}_3\text{O}_{2(\text{aq})} \rightarrow \text{H}_2\text{O}_{(\text{L})} + \text{C}_2\text{H}_3\text{O}_2^-$   
*(since acetic acid is weak, it should be represented as a molecule, not as separated ions)*
- Magnesium phosphate reactant is not soluble therefore no reaction can occur.
- Strontium hydroxide is soluble enough, and since you are told "solution" you can assume dissolved.  
 Skeleton:  $\text{Sr}(\text{OH})_{2(\text{aq})} + \text{HNO}_3 \rightarrow \text{Sr}(\text{NO}_3)_2 + \text{H}_2\text{O}_{(\text{L})}$   
 Balanced:  $\text{Sr}(\text{OH})_{2(\text{aq})} + 2 \text{HNO}_3 \rightarrow \text{Sr}(\text{NO}_3)_2 + 2 \text{H}_2\text{O}_{(\text{L})}$   
 Net Ionic:  $2 \text{OH}^-_{(\text{aq})} + 2 \text{H}^+_{(\text{aq})} \rightarrow 2 \text{H}_2\text{O}_{(\text{L})}$  can be reduced:  $\text{OH}^-_{(\text{aq})} + \text{H}^+_{(\text{aq})} \rightarrow \text{H}_2\text{O}_{(\text{L})}$

P H3 (pg 4 of 4) **Double Replacement (Acid Base & Precipitation)**

formation of a precipitate  $\therefore$  a reaction occurs.

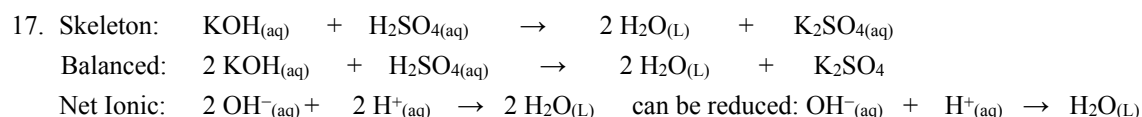


formation of a precipitate  $\therefore$  a reaction occurs.

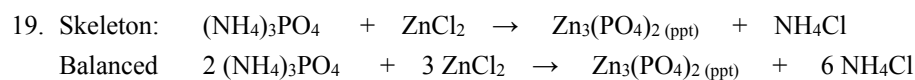
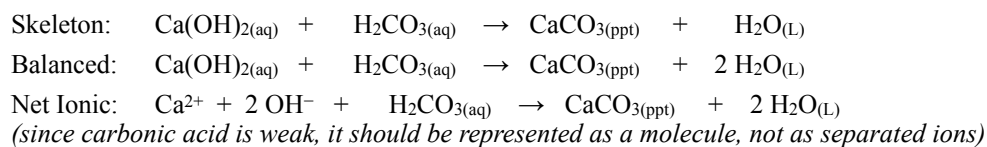


15. tin(II) chromate is not soluble  $\therefore$  no reaction can occur.

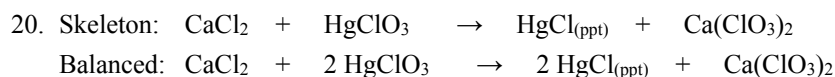
16. both copper chlorate and potassium bromide products are soluble therefore no reaction can occur.



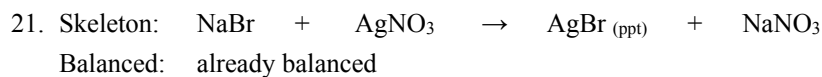
18. You are told a solution of calcium hydroxide, so you can assume the  $\text{Ca}(\text{OH})_2$  is dissolved.



formation of a precipitate  $\therefore$  a reaction occurs.



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