

# Solubility Reactions

## objectives

(#4-2) How do chemicals undergo a solubility reaction?

(#4-2a) A student shall be able to identify if a reaction is a solubility reaction?

(#4-2b) Students should be able to write molecular, ionic and net ionic equations for solubility reactions.

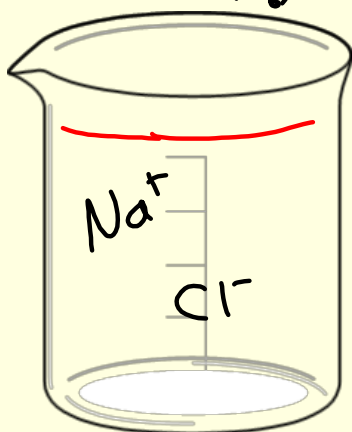
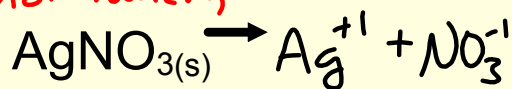
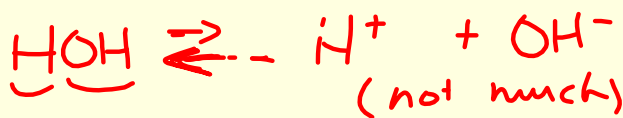
(#4-2c) Students shall be able to model the solubility reactions.

(#4-2d) Students can predict the products of solubility reactions.

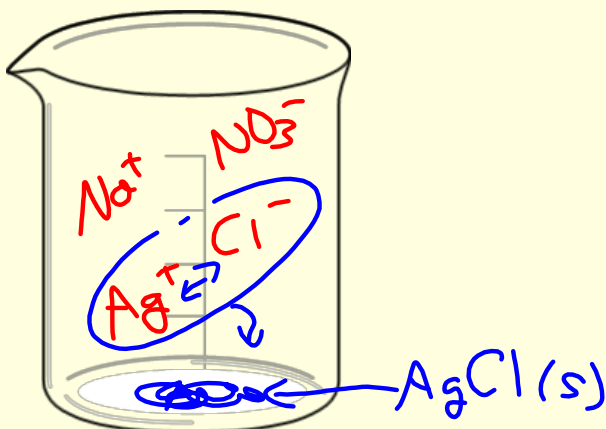
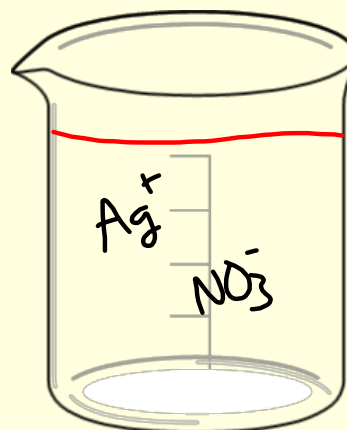
# Solubility Reactions

## Types

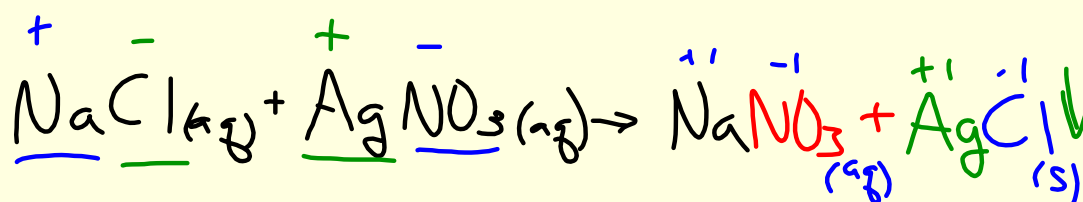
1. Precipitation (create insoluble solid) *does not dissolve*
2. Neutralization Reactions (acid/base, insoluble water as liquid)  $H_2O(l)$



+



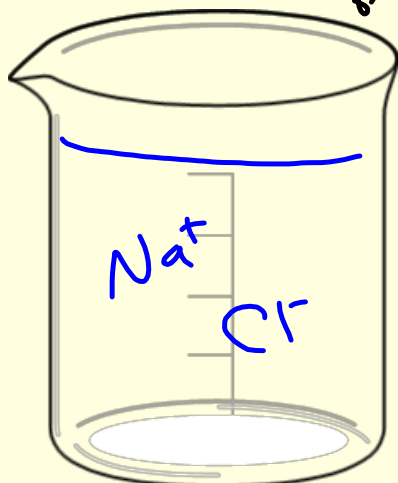
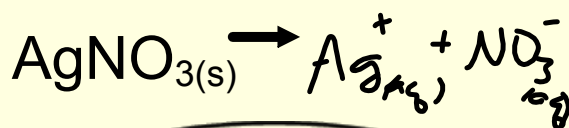
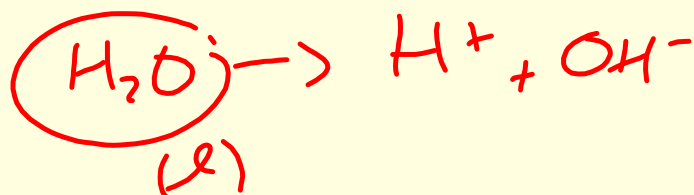
different combinations of ions have different solubilities



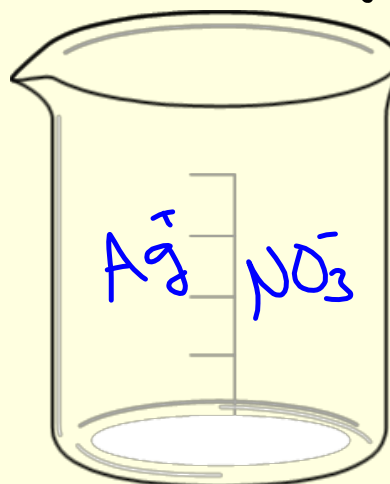
# Solubility Reactions

## Types

1. Precipitation (create insoluble solid)
2. Neutralization Reactions (acid/base, insoluble water as liquid)

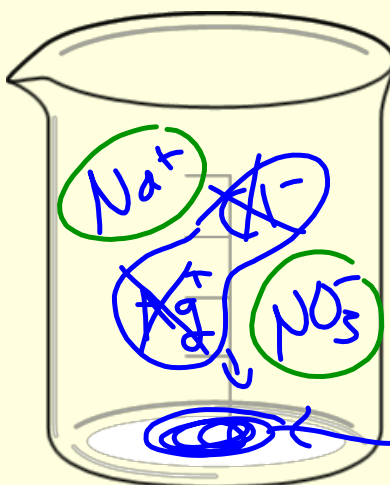


+



soluble =  
dissolves, aq

insoluble  
ppt, solid



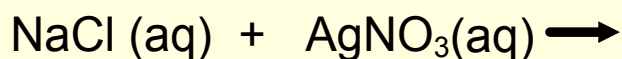
any combo  
insoluble?



different combinations of ions have different solubilities

## Solubility--Predicting products

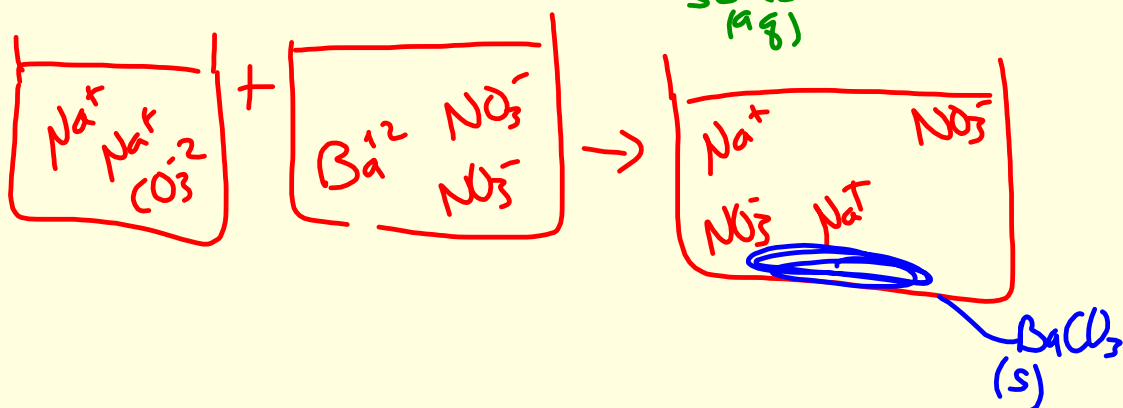
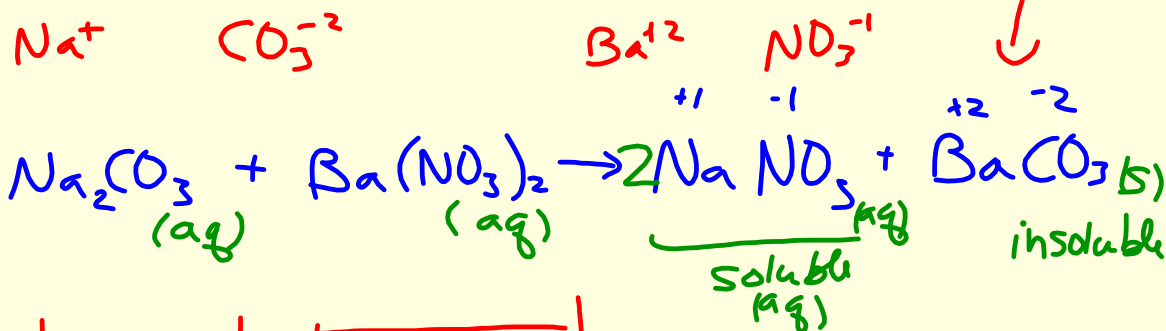
How do you predict the products?  
look at ions and switch partners



check out "other" combinations for solubility  
aqueous (aq) -- soluble (ions)

solid (s)  
(precipitate) } insoluble  
liquid (l)  
(water) }  
gas (g) }

sodium carbonate and barium nitrate:





big idea:

different combinations of ions have different solubilities

What "drives" a reaction?

in order to have a reaction, need insoluble product

-forms at least one precipitate (s) (can have 2)

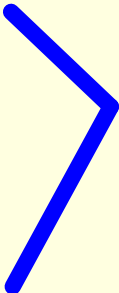
or

-forms HOH(l) which is insoluble --in neutralization rxn

solubility: **check solubility chart**

quick check-**first**

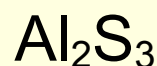
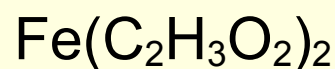
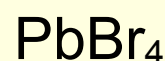
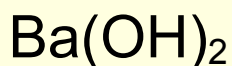
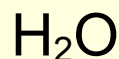
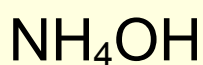
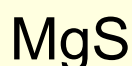
Na<sup>+1</sup>  
K<sup>+1</sup>  
NO<sub>3</sub><sup>-1</sup>  
NH<sub>4</sub><sup>+1</sup>



always soluble

use solubility chart: (aq) or (s) ? H<sub>2</sub>O is (l)

**try these:**



big idea:

different combinations of ions have different solubilities

## What "drives" a reaction?

in order to have a reaction, need insoluble product

-forms at least one precipitate (s) (can have 2)

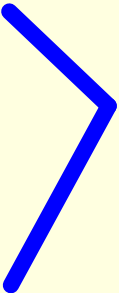
or

-forms HOH(l) which is insoluble --in neutralization rxn

## solubility: check solubility chart

### quick check-first

$\text{Na}^{+1}$   
 $\text{K}^{+1}$   
 $\text{NO}_3^{-1}$   
 $\text{NH}_4^{+1}$



always soluble

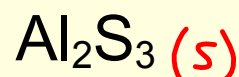
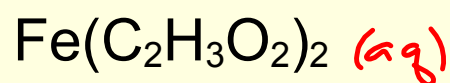
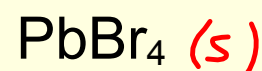
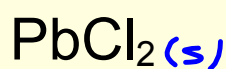
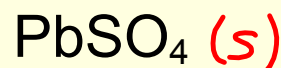
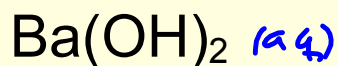
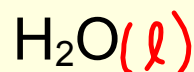
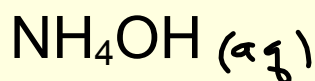
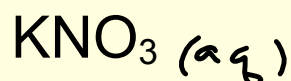
use solubility chart: (aq) or (s) ?  $\text{H}_2\text{O}$  is (l)

try these:

↑ soluble

↑ insoluble

↑ insoluble



big idea:

different combinations of ions have different solubilities

## Molecular, ionic, and net ionic equations

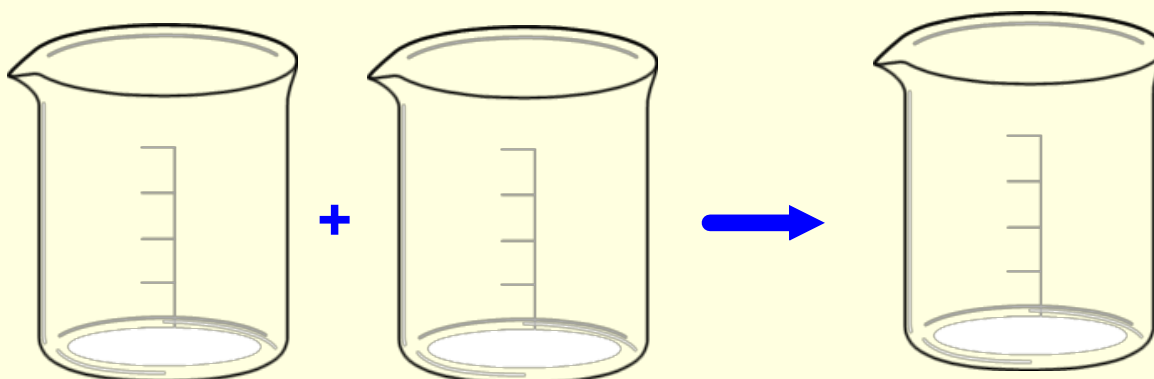
molecular:  $\text{AgNO}_3( ) + \text{NaCl}( )$

ionic:

all (aq) are dissociated

net ionic:

(remove spectator ions)

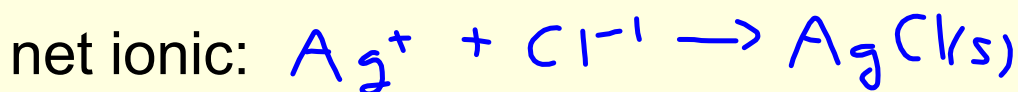
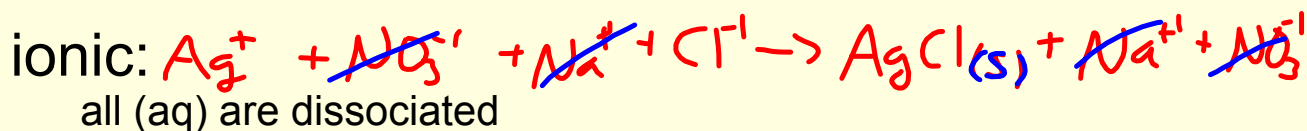
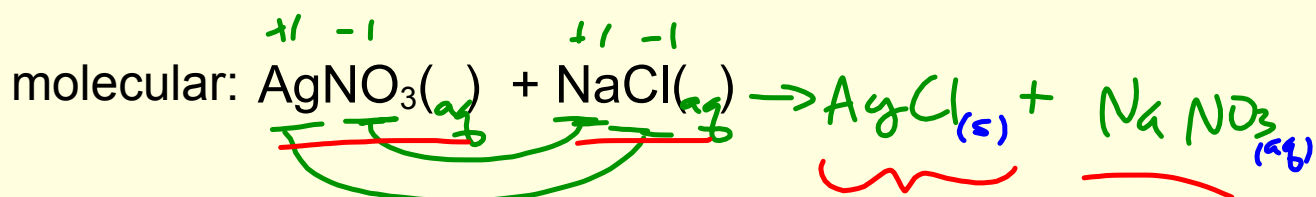




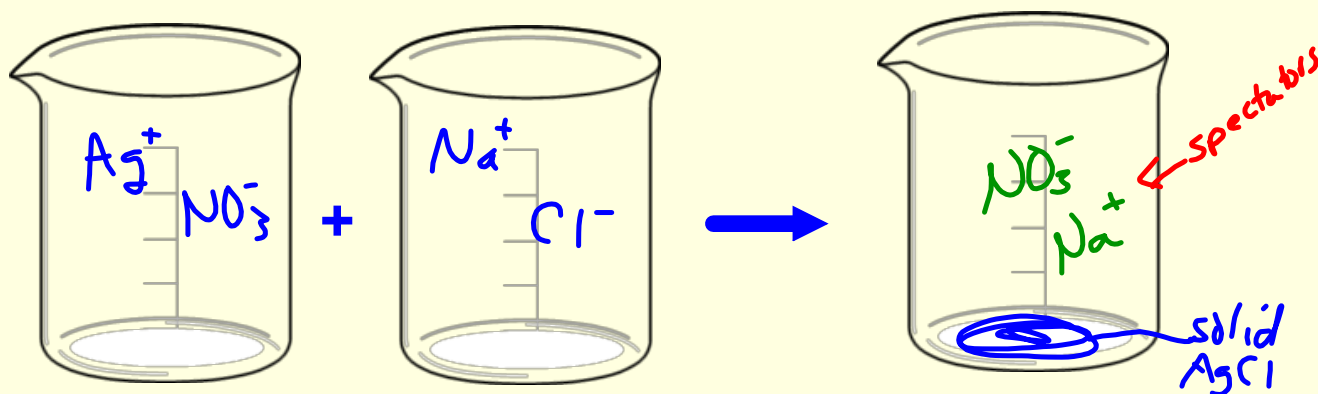
big idea:

different combinations of ions have different solubilities

## Molecular, ionic, and net ionic equations



(remove spectator ions)

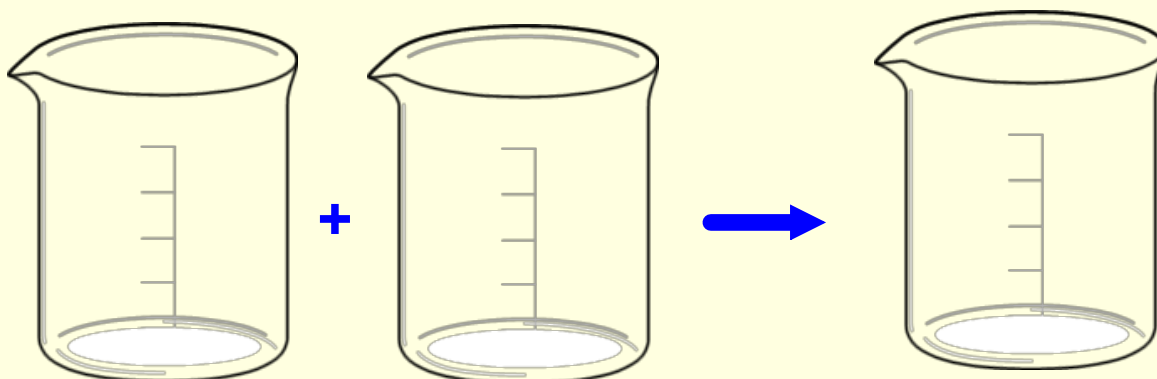


## ammonium nitrate + sodium chloride

molecular:

ionic:

net ionic:



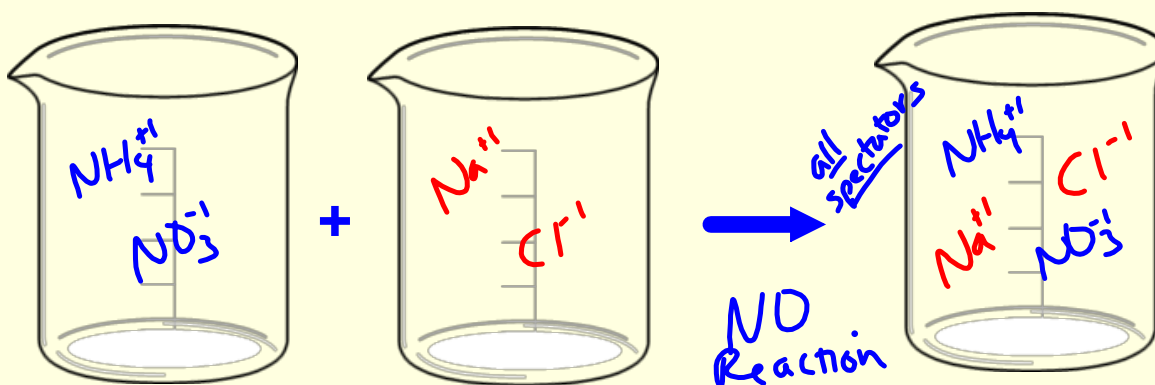
if all aqueous.... no rxn

$\text{NH}_4^+$      $\text{NO}_3^-$      $\text{Na}^+$      $\text{Cl}^-$   
 ammonium nitrate + sodium chloride

molecular:  $\text{NH}_4\text{NO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{NH}_4\text{Cl}(\text{aq}) + \text{NaNO}_3(\text{aq})$   
 Both aqueous (soluble)

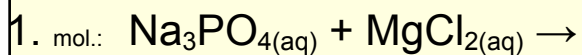
ionic:  $\text{NH}_4^+ + \text{NO}_3^- + \text{Na}^+ + \text{Cl}^- \rightarrow \text{NH}_4^+ + \text{Cl}^- + \text{Na}^+ + \text{NO}_3^-$   
 No Reaction!

net ionic: none!



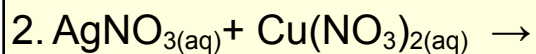
if all aqueous.... no rxn

## Practice:



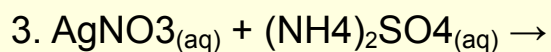
ionic:

net ionic:



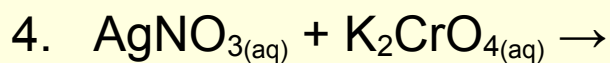
ionic:

net ionic:



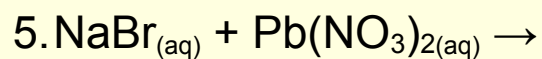
ionic:

net ionic:



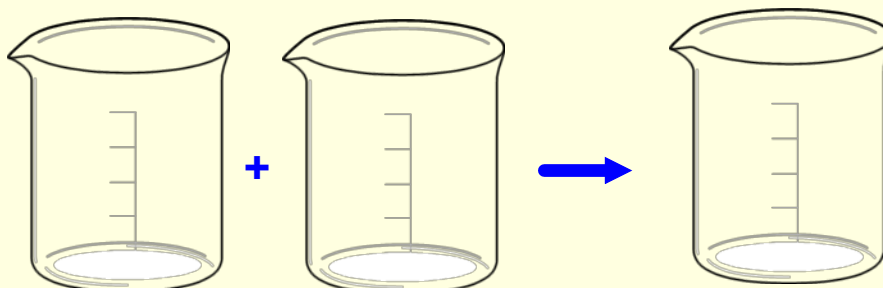
ionic:

net ionic:



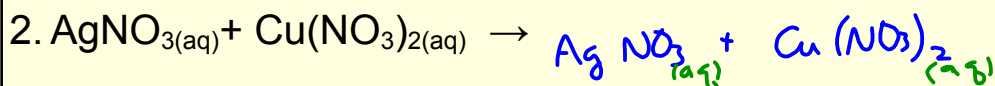
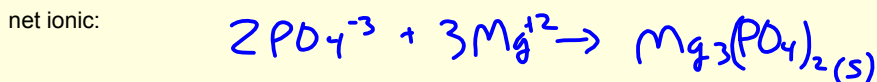
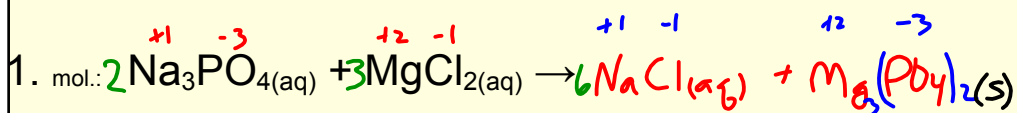
ionic:

net ionic:



Dec 8-7:49 AM

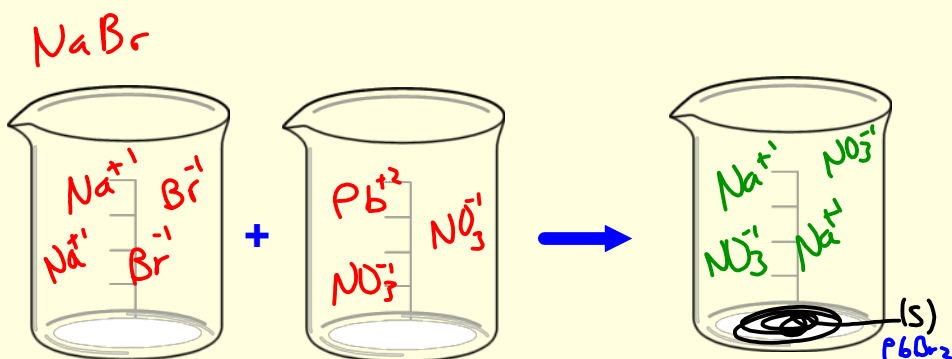
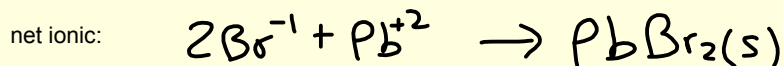
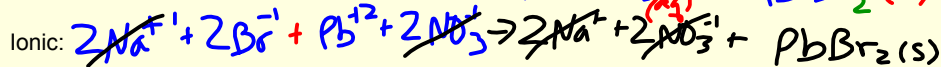
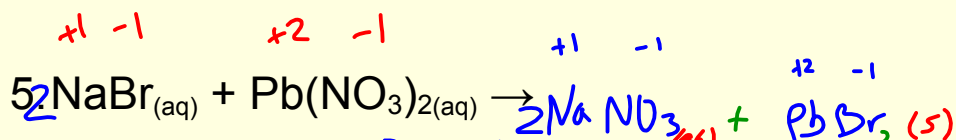
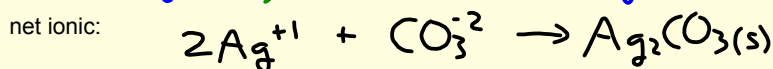
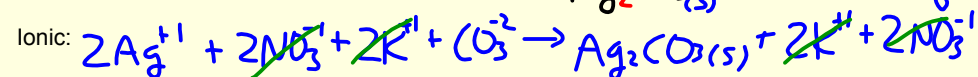
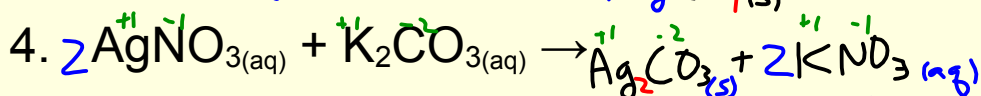
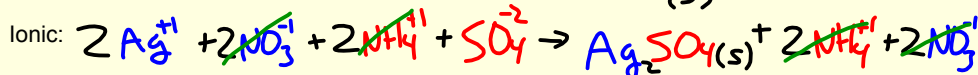
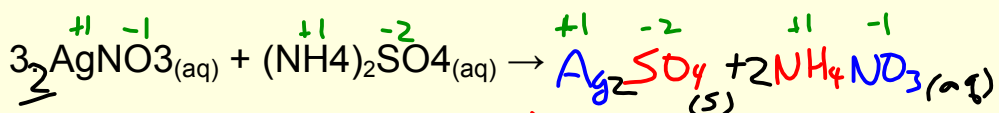
## Practice:



Ionic:

net ionic:

\* No Reaction  
 \* No new combinations of ions to make a solid



**Solubility Reactions--****Neutralization reactions (acid base rxns):**

reactants: acid cation: \_\_\_\_, base anion: \_\_\_\_

products: \_\_\_\_\_( ) and salt (ionic substance)

