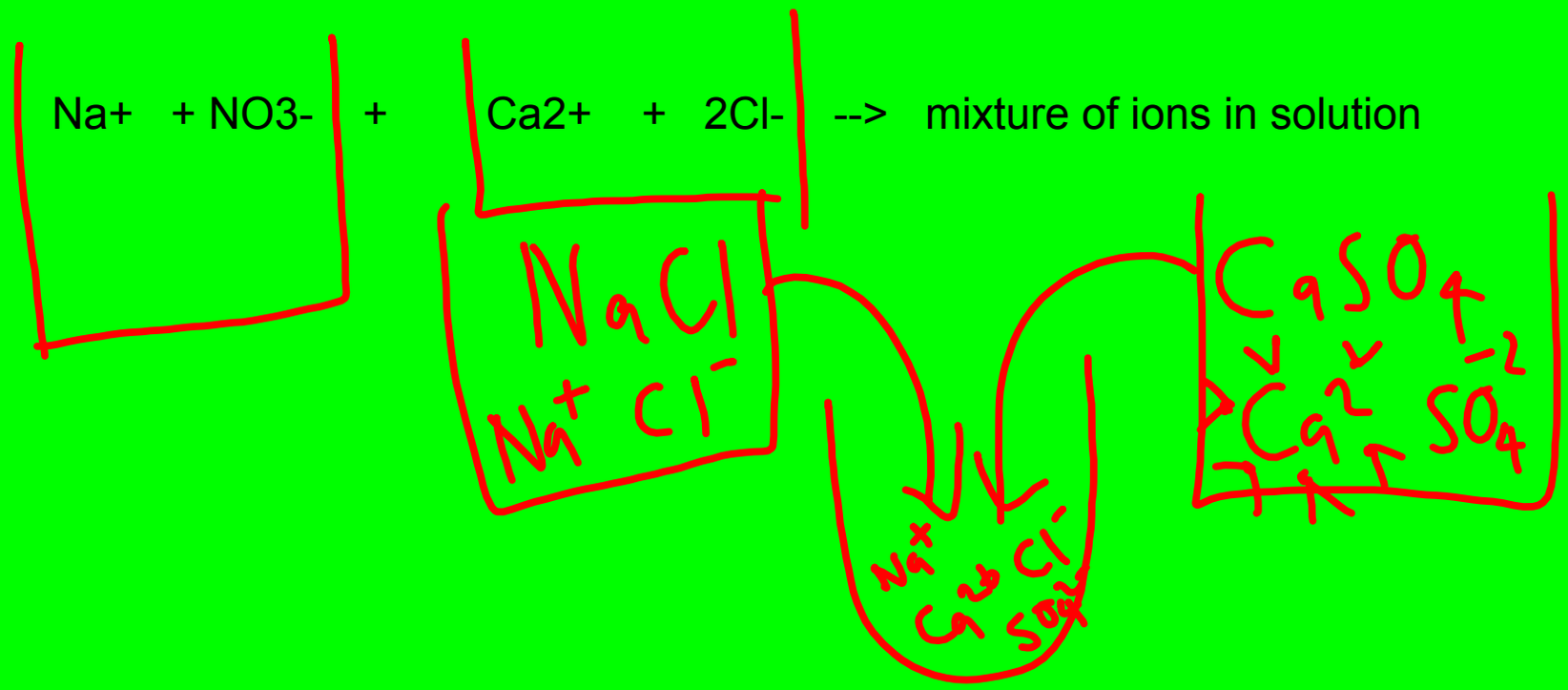
| | Chloride<br>Cl- | Sulfate | Carbonate | Hydroxide |
|---|---|---|---|---|
| Barium | | I | INSOLUBLE | INSOLUBLE |
| Calcium | | D | | |
| Iron | | D | | |
| Copper | | D | | |
| Lead | | I | | |

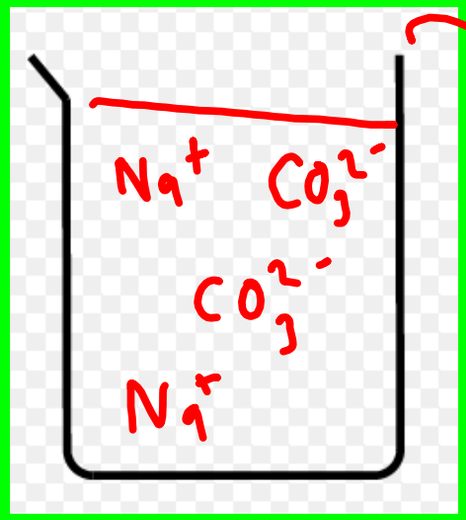
1. If two salt solutions are mixed together and no precipitate forms then
NO reaction has occurred

eg. sodium nitrate + calcium chloride --> no reaction in the beaker

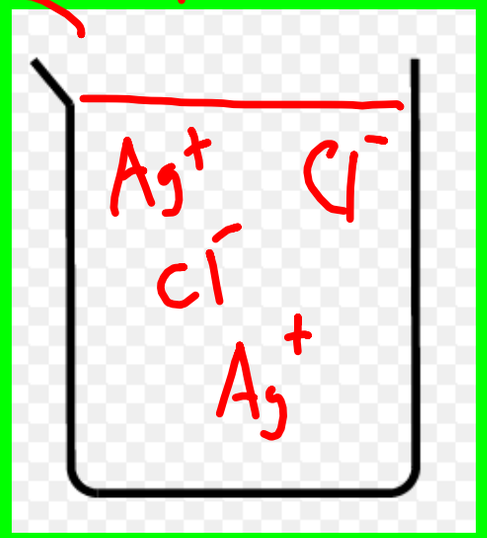
Na+ + NO3- + Ca2+ + 2Cl- --> mixture of ions in solution

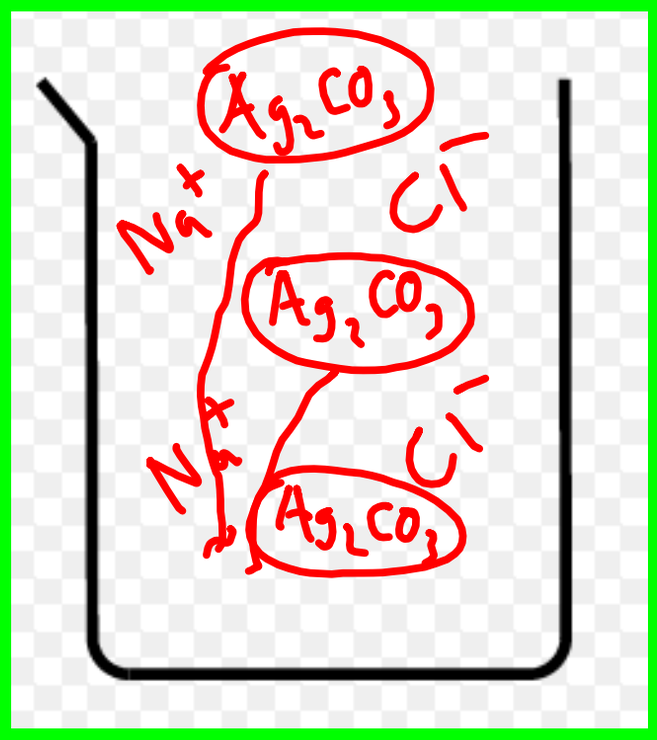


Sodium Carbonate




Silver Chloride




~~Sodium Chloride~~

Silver Carbonate

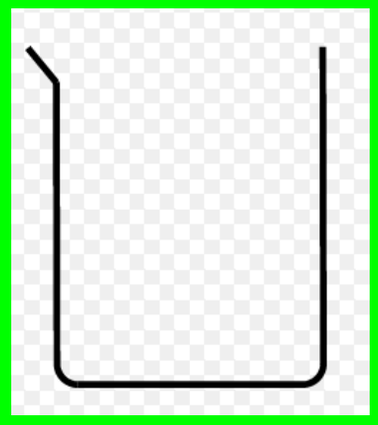
INS

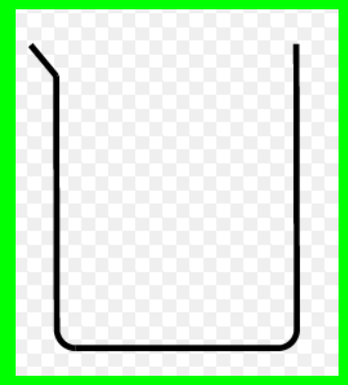
Silver Nitrate Sodium Chloride

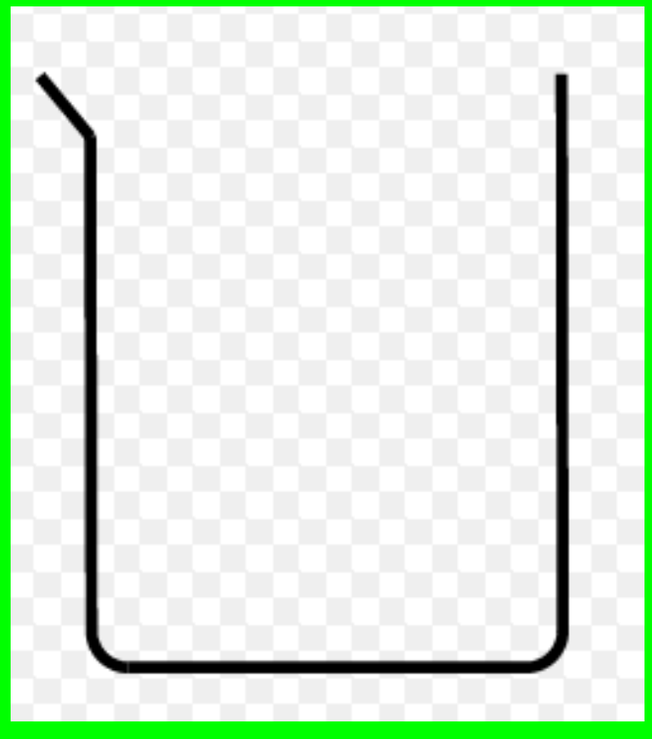
2.If two salt solutions are mixed together and a precipitate occurs then a REACTION has occurred

silver nitrate+sodium chloride -->Sodium ions+Nitrate ions+silver chloride(white precipitate)

we use the solubility rules to find out which ions cause the precipitate







Use the so
forms wher
the precipit

of

| Anion | Cation | |
|---|---|---|
| | soluble (no reaction) | insoluble (precipitate forms) |
| nitrates $NO_3^-$ | all | |
| acetates $CH_3COO^-$ | all | |
| chlorides $Cl^-$ | most | $Ag^+$ $(Pb^{2+})^*$ |
| sulfates $SO_4^{2-}$ | most | $Ba^{2+}$,$(Ca^{2+})^\#$,$Pb^{2+}$,$(Ag^+)^\#$ |
| sulfides $S^{2-}$ | Group 1, $NH_4^+$, Group 2 | most |
| hydroxides $OH^-$ | Group 1, $NH_4^+$, $Ba^{2+}$ | most |
| carbonates $CO_3^{2-}$ | Group 1, $NH_4^+$ | most |

barium chloride + sodium sulfate _____

~~barium chloride + potassium hydroxide~~ _____

calcium nitrate + ammonium sulfate _____

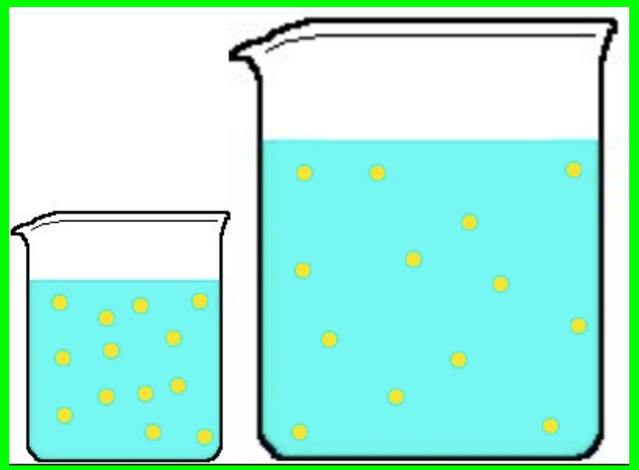
copper sulfate + ammonium sulfide _____

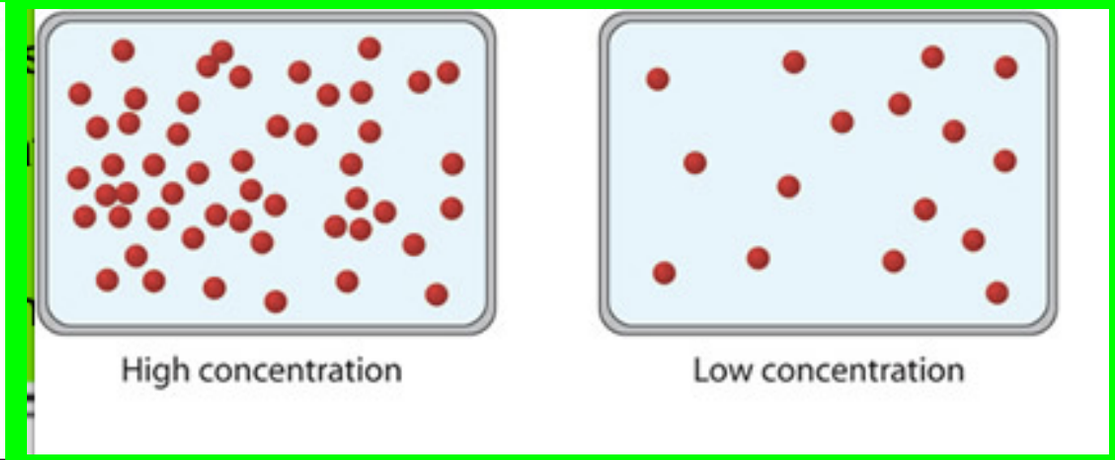
lead acetate + sodium carbonate _____

Concentration and solubility

Whether a precipitate forms or not will depend on the concentration of the ions that are mixed

In the experiment the other day we used 5% salt solutions. What does that mean?






Concentration units are tricky but really important

a) Percentage by mass (mass of sol/mass of solvent m/m) eg 5% NaCl is 5 grams of NaCl in 100 grams of solution

b)Percentage volume (mixtures of liquids v/v) 10% ethanol in 100ml of solution

c)Mass per volume (used in medicine) blood alcohol level of 0.02 refers to 0.020 g/ 100 mls of bloods

d)Parts per million

$Ba^{2+}_{(aq)} + SO_4^{2-}_{(aq)} \longrightarrow BaSO_{4(s)}$ barium sulfate

$Ca^{2+}_{(aq)} + SO_4^{2-}_{(aq)} \longrightarrow CaSO_{4(s)}$ calcium sulfate

$Cu^{2+}_{(aq)} + S^{2-}_{(aq)} \longrightarrow CuS_{(s)}$ copper sulfide

$Pb^{2+}_{(aq)} + CO_3^{2-}_{(aq)} \longrightarrow PbCO_{3(s)}$ lead carbonate

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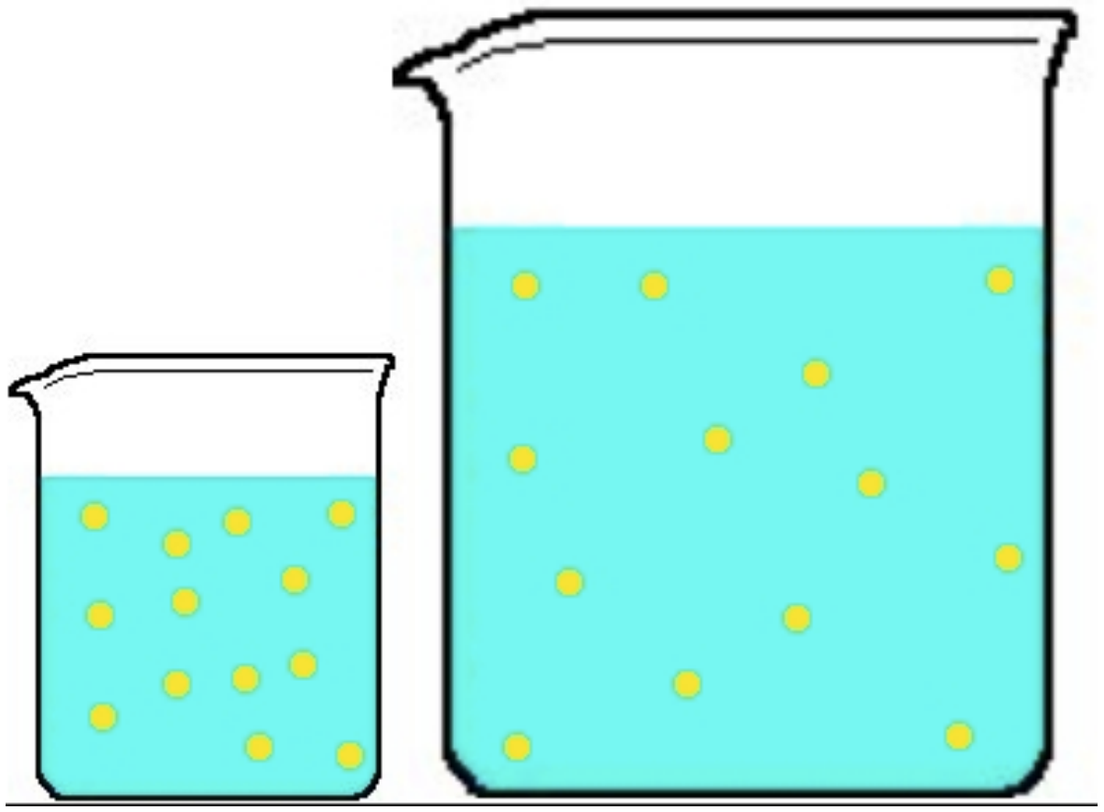


Writing Ionic Equations

1.When writing an equation for a reaction that forms a precipitate there is no need to show

spectator ions as they are still floating around in the solution

2. The ions that come together and form ionic bonds are the reaction ions and are the only ones you need to show in a net ionic equation

3.Can you think of any disadvantages of an ionic equation?

Advantage-you can see clearly which ions can be reacted together to form precipitates

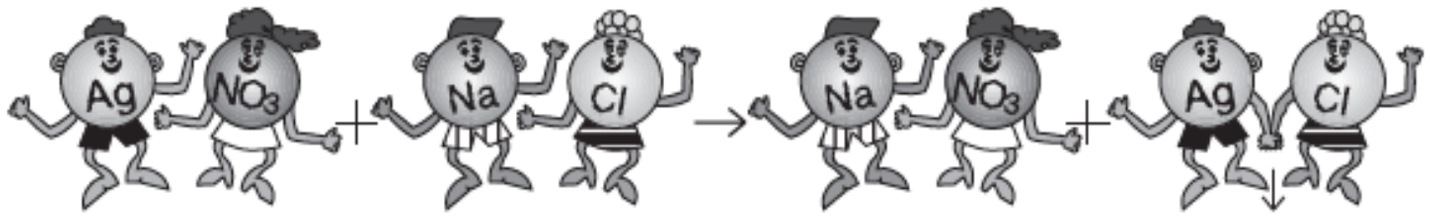
eg. Ag+(aq)  + Cl- (aq)  --> AgCl (s)

Any solution containing _____ ions and Chloride ions will react to form Silver Chloride Precipitate

CHALLENGE

Go back and write net ionic equations for the precipitates in the earlier equations.

| **Anion** | **Cation** | |
|---|---|---|
| | soluble (no reaction) | insoluble (precipitate forms) |
| nitrates $NO_3^-$ | all | |
| acetates $CH_3COO^-$ | all | |
| chlorides $Cl^-$ | most | $Ag^+$ ($Pb^{2+}$)* |
| sulfates $SO_4^{2-}$ | most | $Ba^{2+}$,($Ca^{2+}$)#,$Pb^{2+}$,($Ag^+$)# |
| sulfides $S^{2-}$ | Group 1, $NH_4^+$, Group 2 | most |
| hydroxides $OH^-$ | Group 1, $NH_4^+$, $Ba^{2+}$ | most |
| carbonates $CO_3^{2-}$ | Group 1, $NH_4^+$ | most |


Ag
NO3
Na
Cl
Na
NO3
Ag
Cl