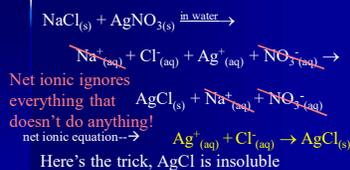


Ionic interactions

- When you dissolve 2 or more ionic compounds in water some parts of it may react together and precipitate out
- Precipitate-solid falling out of solution
- More times than not, most (if not all) of the ions do nothing
- Net ionic equations are only concerned with the ions that do something

This goes back to ionic dissociation in water



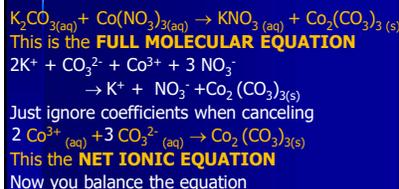
More net ionic equations

- You normally write the reactants as aqueous (since you are dissolving them)
 - $\text{Mg}(\text{NO}_3)_2(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{MgCO}_3(\text{s}) + 2\text{NaNO}_3(\text{aq})$
 - Dissociate everything that is aqueous, not solid
 - $\text{Mg}^{2+} + 2\text{NO}_3^- + 2\text{Na}^+ + \text{CO}_3^{2-} \rightarrow \text{MgCO}_3(\text{s}) + 2\text{Na}^+ + 2\text{NO}_3^-$ ionic equation
 - Now cancel out everything that is the same on both sides of the equation
 - These are called **spectator ions**
- $$\text{Mg}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{MgCO}_3(\text{s})$$

What if nothing precipitates out?

- $\text{K}_2\text{SO}_4(\text{aq}) + \text{NaNO}_3(\text{aq}) \rightarrow \text{KNO}_3(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq})$
- (by the way, this equation isn't balanced)
- $2\text{K}^+ + \text{SO}_4^{2-} + \text{Na}^+ + \text{NO}_3^- \rightarrow \text{K}^+ + \text{NO}_3^- + 2\text{Na}^+ + \text{SO}_4^{2-}$
- Everything cancels out
- There is no net ionic equation

Practice with equations that are not yet balanced



Tip to make sure your answer is right

- Make sure you have the same atoms on each side of the equation
- If your final answer is something like $\text{K}^+ + \text{CO}_3^{2-} \rightarrow \text{CaCO}_3(\text{s})$
- It is wrong!!!
- Atoms don't spontaneously change into other atoms (without a nuclear reaction)

Solubility rules

- Rules to determine if something is soluble (will stay dissolved--aq--) or when it is insoluble (will precipitate out, become a solid--s--)
- You will be able to use the solubility rules sheet on the test.

Soluble Compounds

- All compounds of **Group 1** are soluble except LiF, Li₂S, and Cs₂S.
- All **ammonium** (NH₄⁺) compounds are soluble.
- All **acetates** (CH₃COO⁻) are soluble except Fe³⁺
- All **nitrates** (NO₃⁻) and **chlorates** (ClO₃⁻) are soluble.

Soluble Compounds cont.

- All binary compounds of the **halogens** (other than F) with metals are soluble, except those of Silver, Mercury, and Lead. Fluorides are insoluble except for rule 1 and 2.
- All **sulfates** are soluble except those of barium, strontium, calcium, silver, mercury, and lead.

Insoluble Compounds

- Except for rule 1 and 2, **carbonates, oxalates, sulfites, chromates, oxides, silicates, and phosphates** are insoluble.
- Except for rule 1 and 2 **hydroxides** are insoluble except Ba, Sr, and Ca
- Except for rule 1 and 2, **Sulfides** are insoluble except for calcium, barium, strontium, magnesium.

Examples

| | |
|----------------|----------------|
| ▪ K_3N | K_2CrO_4 |
| ▪ Na_2CO_3 | $BaSO_3$ |
| ▪ Li_2S | $(NH_4)_3PO_4$ |
| ▪ NH_4NO_3 | $FeSiO_3$ |
| ▪ $Mg(NO_3)_2$ | CuO |
| ▪ $AgClO_3$ | $NaOH$ |
| ▪ $AgCl$ | $Ba(OH)_2$ |
| ▪ CuF_2 | $Ni(OH)_2$ |
| ▪ $CrSO_4$ | MgS |
| ▪ $CaSO_4$ | BeS |

Examples

| | | | |
|----------------|--------|----------------|--------|
| ▪ K_3N | ▪ (aq) | K_2CrO_4 | ▪ (aq) |
| ▪ Na_2CO_3 | ▪ (aq) | $BaSO_3$ | ▪ (s) |
| ▪ Li_2S | ▪ (s) | $(NH_4)_3PO_4$ | ▪ (aq) |
| ▪ NH_4NO_3 | ▪ (aq) | $FeSiO_3$ | ▪ (s) |
| ▪ $Mg(NO_3)_2$ | ▪ (aq) | CuO | ▪ (s) |
| ▪ $AgClO_3$ | ▪ (aq) | $NaOH$ | ▪ (aq) |
| ▪ $AgCl$ | ▪ (s) | $Ba(OH)_2$ | ▪ (aq) |
| ▪ CuF_2 | ▪ (s) | $Ni(OH)_2$ | ▪ (s) |
| ▪ $CrSO_4$ | ▪ (aq) | MgS | ▪ (aq) |
| ▪ $CaSO_4$ | ▪ (s) | BeS | ▪ (s) |

Net Ionic Equations

- Identify what is soluble or insoluble and write the net ionic equation
- $CuNO_3 + Na_2SO_3 \rightarrow NaNO_3 + Cu_2SO_3$
- $Ni(ClO_3)_2 + NaCH_3COO \rightarrow NaClO_3 + Ni(CH_3COO)_2$
- $Pb(NO_3)_4 + (NH_4)_2SO_4 \rightarrow Pb(SO_4)_2 + NH_4NO_3$

Net Ionic Equations

- Identify what is soluble or insoluble and write the net ionic equation
- $CuNO_3 + Na_2SO_3 \rightarrow NaNO_3 + Cu_2SO_3$
- $2 Cu^{+}_{(aq)} + SO_3^{2-}_{(aq)} \rightarrow Cu_2SO_3(s)$
- $Ni(ClO_3)_2 + NaCH_3COO \rightarrow NaClO_3 + Ni(CH_3COO)_2$
- No net ionic equation
- $Pb(NO_3)_4 + (NH_4)_2SO_4 \rightarrow Pb(SO_4)_2 + NH_4NO_3$
- $Pb^{4+}_{(aq)} + 2 SO_4^{2-}_{(aq)} \rightarrow Pb(SO_4)_2(s)$