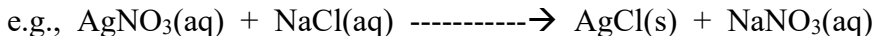


Lesson #2: Writing equations and separating ions

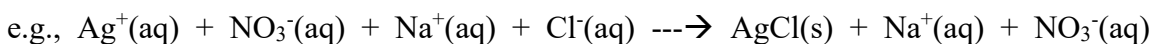
Part I: Writing equations

Three forms of equations are generally used in Chemistry 12

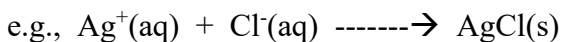
1. Molecular **or** Formula equation – all species are written as molecules regardless of whether they actually dissociate or not.



2. Complete **or** total ionic equation – all soluble ions are shown as dissociated.



3. Net ionic equation – the total ionic equation with the spectator ions removed.
(i.e., soluble ions that do not change are removed)



Orally: *Quickly discuss the advantages/disadvantages to each equation type.*

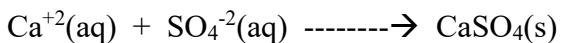
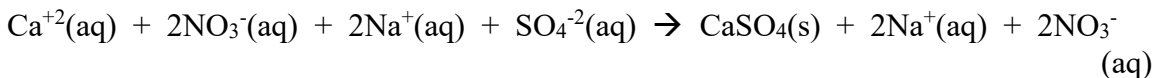
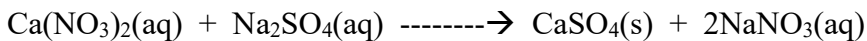
The Net ionic equation is the one we focus on this chapter.

Practice:

Complete the following molecular equation and then write the ionic and net ionic equations.



Solution:



Part II: Separating Ions in solution

Orally:

The following filtration technique can be used to identify specific elements in solution as well as separate them from each other.

Refer students to page 4 of the data booklet and quickly review how we determine if a precipitate will form or not.

1. Assume that a solution contains one or both of the following cations: Ba^{+2} and Pb^{+2} . Determine which (if any) of the cations are present given the following data.

Ion Added	Cl^-	SO_4^{-2}
Results	No ppt	ppt.

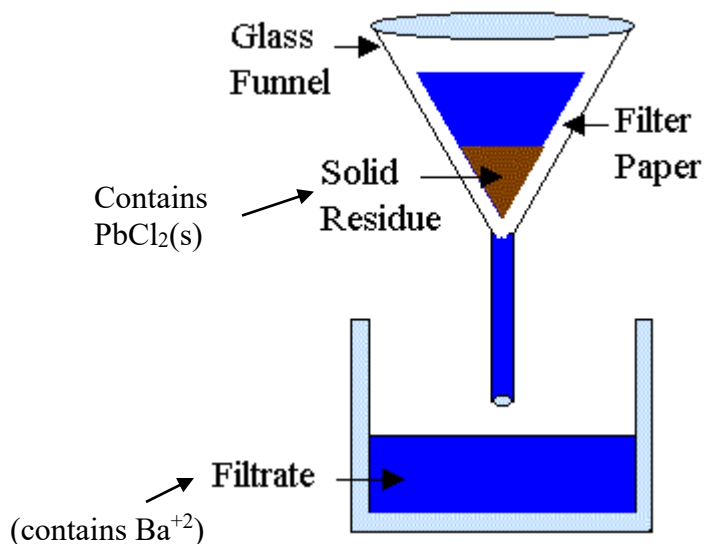
Solution: Only the Ba^{+2} ion is present b/c Cl^- would form a ppt with Pb^{+2} .

2. Assume you have a solution that contains Ba^{+2} and Pb^{+2} . Devise a filtration scheme that allows you to separate the ions.

Step #1: Add a source of soluble Cl^-

Step #2: Write the net ionic equation: $\text{Pb}^{+2}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$

Step #3: Filter the solution to remove the solid. Now the Pb^{+2} ion is in the filter paper and the Ba^{+2} is still dissolved in solution.



Orally:

Q: Why not add SO_4^{-2} ?

A: SO_4^{-2} would precipitate both ions at the same time. This defeats the purpose of separating the ions because both cations would be captured by the filter paper.

3. A solution contains one or more of the following cations: Cu^+ , Cu^{+2} , Sr^{+2} .
What ions could be added, and what order, to determine which of these cations are present?

	Cl^-	SO_4^{-2}	S^{-2}	OH^-
Cu^+	ppt	-	ppt	ppt
Cu^{+2}	-	-	ppt	ppt
Sr^{+2}	-	ppt	-	-

Solution: There are a couple of possibilities to solve this problem (here's one).

#1: Begin by adding Cl^- b/c it will only ppt the Cu^+ and then filter to remove Cu^+

#2: Add SO_4^{-2} to ppt the SO_4^{-2} and then filter the Sr^{+2} out.

#3: Add S^{-2} or OH^- to ppt the Cu^{+2}

http://www.mhhe.com/physsci/chemistry/animations/chang_7e_esp/crm3s2_3.swf