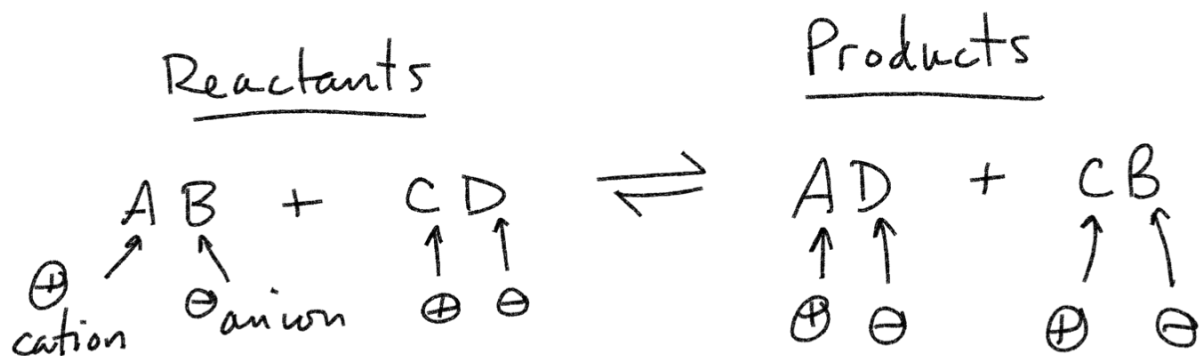


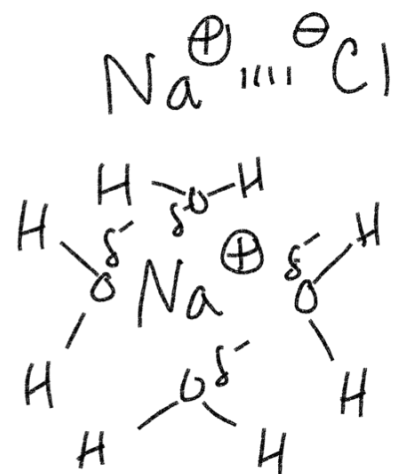
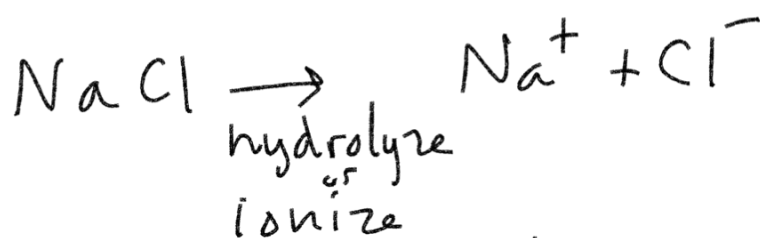
# Double Replacement Reactions



"salts"  $\rightarrow$  ionic compound

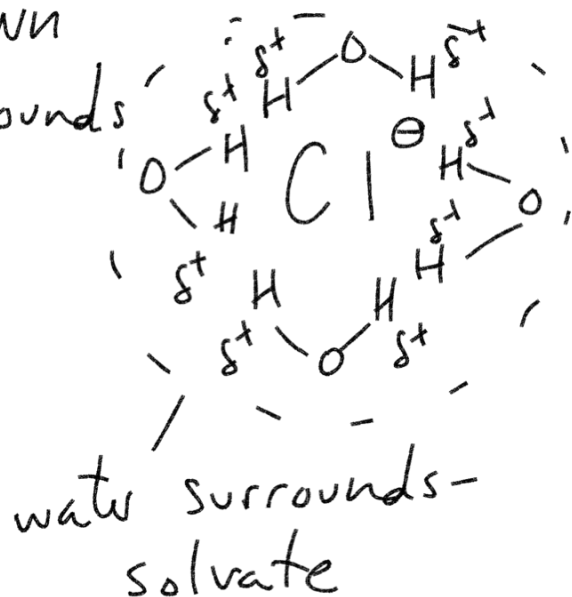
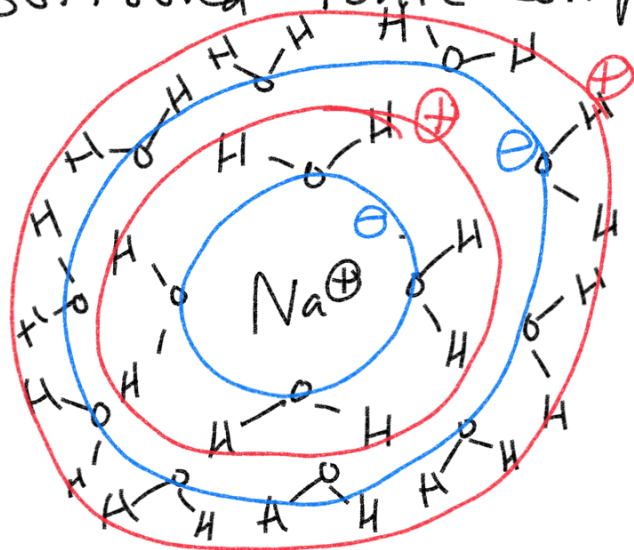
Ionic compounds break down in an aqueous environment

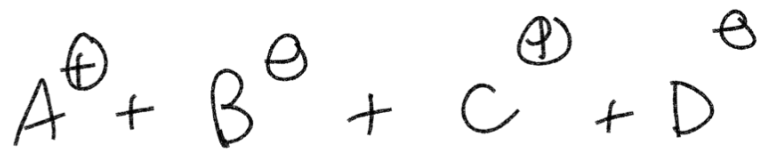
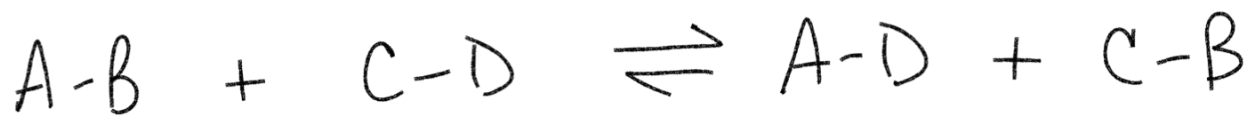
$\text{NaCl} \rightarrow$  table salt



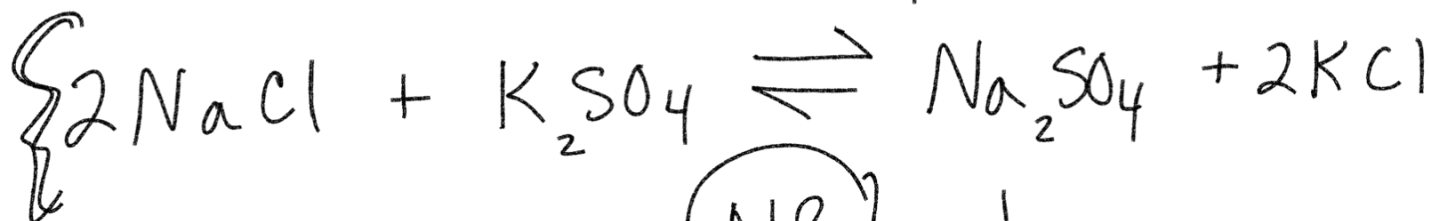
Water molecules break down and surround ionic compounds

charge dilution





breaks down  $\uparrow$  solid  
(aq) (s)



(NR)

→ because no precipitate formed.  
solid that does not dissolve in water.

Single Replacement



## Solubility Rules

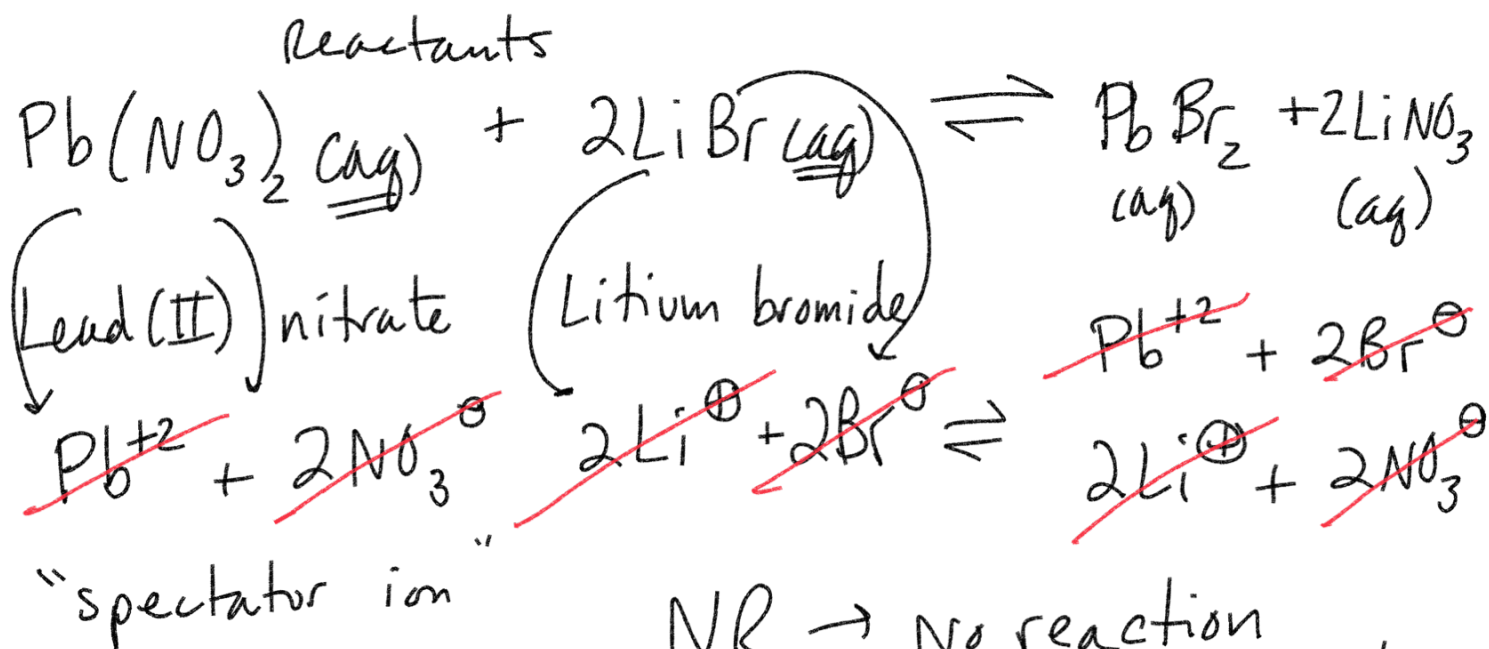
You can/should use this  
on tests & quizzes.

Whether or not a reaction forms a precipitate is dictated by the solubility rules. These rules provide guidelines that tell which ions form solids and which remain in their ionic form in aqueous solution. The rules are to be followed from the top down, meaning that if something is insoluble (or soluble) due to rule 1, it has precedence over a higher-numbered rule.

soluble means break down in water

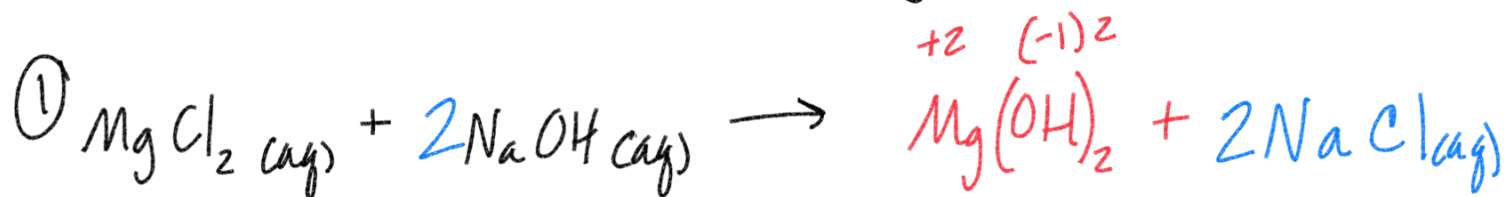
- Most important
1. Salts formed with group 1 cations and  $\text{NH}_4^+$  cations are **soluble**. There are some exceptions for certain  $\text{Li}^+$  salts.
  2. Acetates ( $\text{C}_2\text{H}_3\text{O}_2^-$ ), nitrates ( $\text{NO}_3^-$ ), and perchlorates ( $\text{ClO}_4^-$ ) are **soluble**.
  3. Bromides, chlorides, and iodides are **soluble**.
  4. Sulfates ( $\text{SO}_4^{2-}$ ) are **soluble** with the exception of sulfates formed with  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ , and  $\text{Ba}^{2+}$ .
  5. Salts containing silver, lead, and mercury (I) are **insoluble**.
  6. Carbonates ( $\text{CO}_3^{2-}$ ), phosphates ( $\text{PO}_4^{3-}$ ), sulfides, oxides, and hydroxides ( $\text{OH}^-$ ) are **insoluble**. Sulfides formed with group 2 cations and hydroxides formed with calcium, strontium, and barium are exceptions.
- Least

If the rules state that an ion is soluble, then it remains in its aqueous ion form. If an ion is insoluble based on the solubility rules, then it forms a solid with an ion from the other reactant. If all the ions in a reaction are shown to be soluble, then no precipitation reaction occurs.



NR → No reaction

Because it does not form a solid  
No insolubility.



① Double replacement

② Stoichiometric

③ Review solubility rules

④ Eliminate spectator ions

