

## Types of Chemical Reactions

Type of Reaction	What Happens	Common Form
Synthesis Reaction	Two or more substances come together to make <u>1</u> new substance.	$A + B \rightarrow C$
Decomposition Reaction	One substance breaks down into two or more simpler substances.	$C \rightarrow A + B$
Single Replacement Reaction	One element replaces another in a compound.	$A + BC \rightarrow AC + B$
Double Replacement Reaction	Ions of two compounds exchange places to form two new compounds.	$AB + CD \rightarrow AD + CB$
Combustion reaction	A substance combines with <u>oxygen</u> gas, releasing large amounts of energy in the form of heat and light.	$C_xH_yO_z + O_2 \rightarrow H_2O + CO_2$

There are three subsets of **double replacement reactions** that you will need to know!

- Precipitation Reaction:** two aqueous solutions mix to form a precipitate (Solid)  $\rightarrow$  more about this shortly!  
 $AB(aq) + CD(aq) \rightarrow AD(s) + CB(aq)$
- Neutralization (Acid-Base) Reaction:** an Arrhenius acid and base react to produce a salt and water.  
 $HB + C(OH) \rightarrow H_2O + CB$
- Gas Evolution Reaction:** two aqueous solutions mix to form a gas which bubbles out of solution. There are four general categories of this reaction type!

### Compounds that Undergo Gas-Evolution Reactions

Reactant Type	Intermediate Product	Gas evolved (with decomposed products, if applicable)
Sulfides	<i>None</i>	$H_2S(g)$
Carbonates and bicarbonates	$H_2CO_3$	$CO_2(g) + H_2O(l)$
Sulfites and bisulfites	$H_2SO_3$	$SO_2(g) + H_2O(l)$
Ammonium	$NH_4OH$	$NH_3(g) + H_2O(l)$

**Oxidation/Reduction Reactions:** I used to be great at redox, but I got a little rusty. ;D

**Oxidation-reduction (redox) reactions:** where electrons are transferred from one atom to another.

- If a substance accepts an electron, it is reduced.
- If a substance loses an electron, it is oxidized.
- Electrons are always transferred from the species that is oxidized to the species that is reduced.

Two great mnemonics!

1. OIL RIG : Oxidation Is Loss (OIL) and Reduction Is Gain (RIG)
2. LEO goes GER : A species loses electrons when oxidized, and gains electrons when reduced.

**Almost all reaction types (except double replacement) are redox.** We will learn soooooo much more about oxidation-reduction reactions next unit!

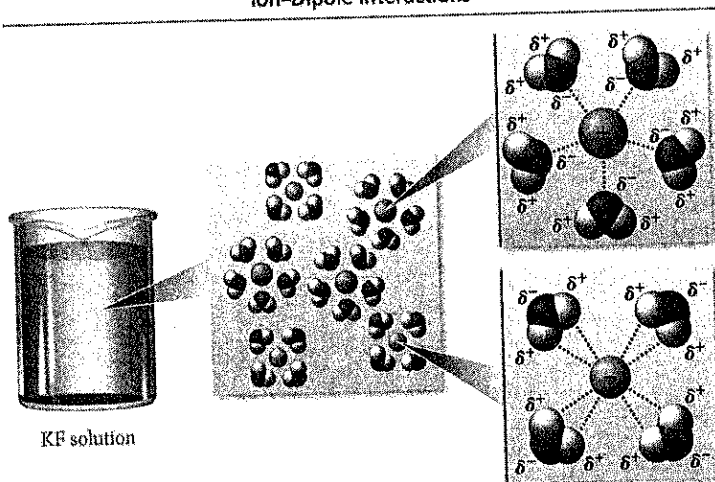
## Precipitation Reactions

**Precipitation Reactions:** a double replacement reaction between aqueous solutions of ionic compounds which produces an ionic compound that is insoluble in water: this insoluble product is called a precipitate.

### Quick review: Ionic Compound Solubility

- When we mix a solute with a solvent, there are attractive forces (ion-dipole IMFs) between the solute and solvent particles – if the attraction is strong enough, this is what allows the solute to dissolve!
- Ions separate (ionize) from one another when dissolved in water (called dissociation)
- The number of ions produced in solution depends on the ratio in the original formula.
  - Ex:  $\text{Pb}(\text{NO}_3)_2$  dissociates to form  $\rightarrow 1 \text{Pb}^{2+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq})$
  - Thus, **1 formula unit** of  $\text{Pb}(\text{NO}_3)_2$  dissociates to form 3 total ions.

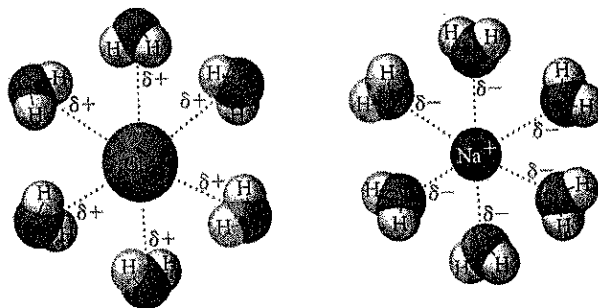
### Ion-Dipole Interactions



© 2014 Pearson Education, Inc.

### Ion-Dipole Forces

The positively charged end of a polar molecule such as  $\text{H}_2\text{O}$  is attracted to negative ions and the negatively charged end of the molecule is attracted to positive ions.



© 2014 Pearson Education, Inc.