

Warm Up!

- Balance!
- $\text{Ca(OH)}_2 \text{ (aq)} + \text{HCl} \text{ (aq)} \rightarrow \text{CaCl}_2 \text{ (aq)} + \text{HOH} \text{ (l)}$
- $\text{Cu} \text{ (s)} + \text{AgNO}_3 \text{ (aq)} \rightarrow \text{Ag} \text{ (s)} + \text{Cu(NO}_3)_2$
- Write the chemical equation, balance, and identify the reaction type.
- Aqueous magnesium iodide and aqueous silver nitrate react to produce solid silver iodide and aqueous magnesium nitrate.

Agenda

- QOTD: How can we predict the products of a replacement reaction?
- Review double and single replacement reactions
- Understand and use the activity series
- Predict the products

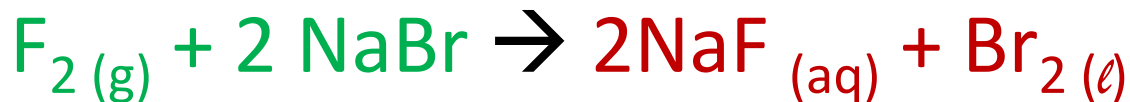
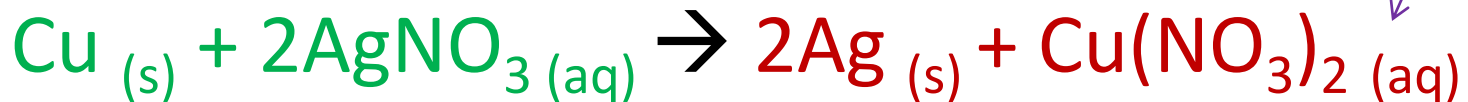
Types of Reactions

- **Single Replacement** – The atoms of one element replace the atoms of another element in a compound.



Think of water as H-OH

Metals are replacing H
or another metal




Nonmetal replaces
nonmetals

Activity Series

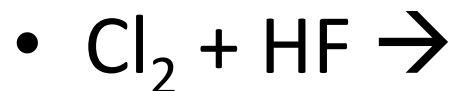
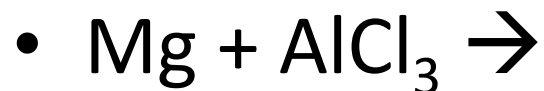
- Chart that indicates which metals will replace others in certain replacement reactions.

Elements can only replace elements that are listed under them!

- Can K replace Zn?
- Can Ag replace Na?
- Can Br replace F?

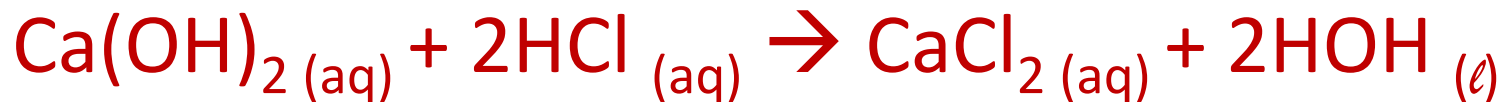
Two Activity Series		
Metals	Decreasing Activity	Halogens
lithium		fluorine
potassium		chlorine
calcium		bromine
sodium		iodine
magnesium		
aluminum		
zinc		
chromium		
iron		
nickel		
tin		
lead		
HYDROGEN*		
copper		
mercury		
silver		
platinum		
gold		

Predict the Products and Balance!



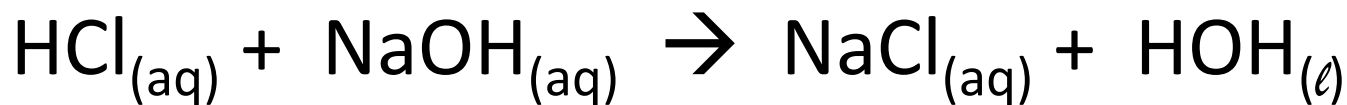
Types of reactions

- **Double replacement** – A replacement reaction that involves an exchange of ions between two compounds.



3 Types of Double Replacement

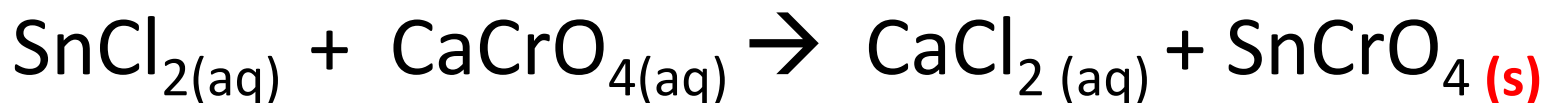
Acid/Base **Neutralization** –always produces water and soluble salt



Acid/salt or Acid/metal – **forms** gas



Salt/salt –When 2 soluble salts **form** a precipitate



Predict the Products and Balance

- $\text{LiI} + \text{AgNO}_3 \rightarrow$
- $\text{BaCl}_2 + \text{K}_2\text{CO}_3 \rightarrow$
- $\text{Na}_2\text{C}_2\text{O}_4 + \text{Pb}(\text{NO}_3)_2 \rightarrow$

Solubility Rules

- To identify whether a double replacement is a **neutralization, ppt, or gas forming** reaction, you must know what compounds form ppt's and which ones form water.
- IS IT SOLUBLE?!?! **Insoluble salts = ppt's**
- Does it form a salt and water?!

Use the table to determine...

Is it soluble??

- ZnCl
- AgCl
- NaNO₃
- CaPO₄
- KOH
- BaCO₃

Will the reaction happen?

- Li + NaCl
- Zn + NaCl
- Co + FeCl₂
- Ca + AlCl₃
- HOH + CuCl₂
- K + Mg(OH)₂

Warm Up!

- Predict the products, balance the reaction, and identify the type of reaction?
- $\text{KOH} + \text{HBr} \rightarrow$
- $\text{Fe} + \text{Na}_3\text{PO}_4 \rightarrow$

Agenda for Today

- What is a net ionic equation and how do you write one?
- Aqueous reactions
- Writing a net ionic equation
- Writing net ionic equations for the 3 types of double displacement reactions.

Types of Reactions

- Non-aqueous (may not occur in solution) –
Combustion – organic (molecular) + O₂ always form CO₂ + H₂O
Synthesis – one product formed
Decomposition – one reactant breaks apart

Types of Reactions

- Aqueous reactions (in water) –

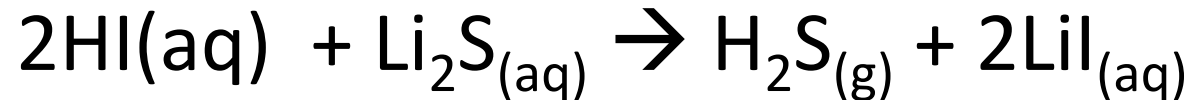
Replacement

DR – precipitates, neutralization, gases

SR – metal or H replaces metal, or nonmetal
replaces nonmetal

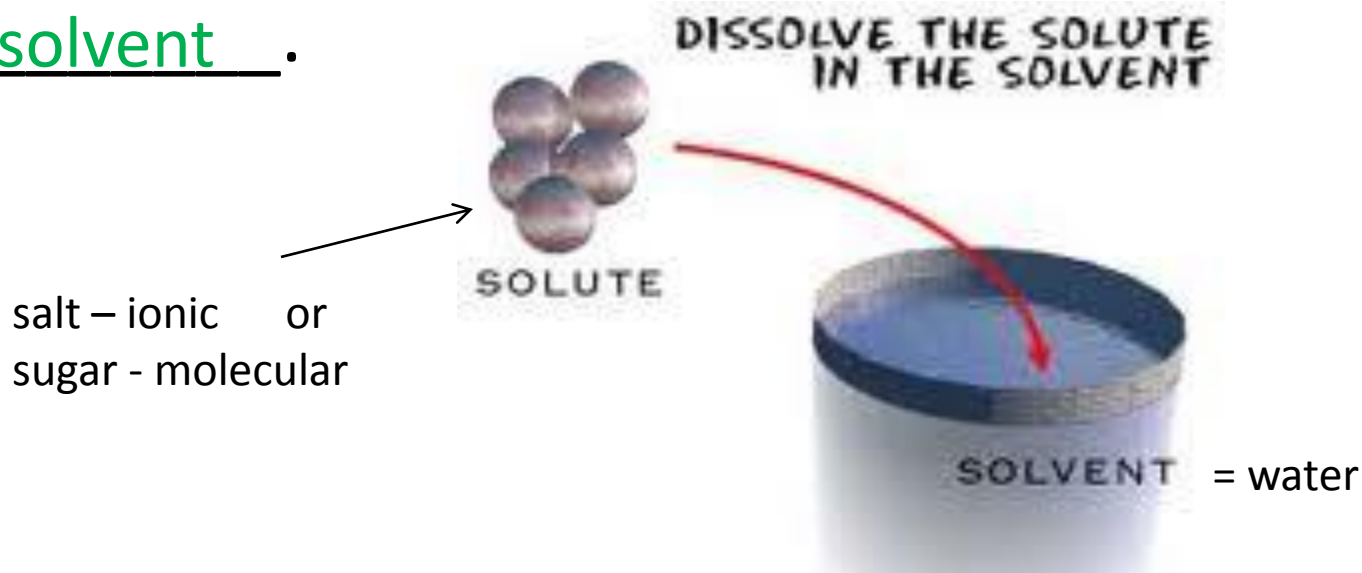
DR reactions forming gases

- Usual gases formed:
- CO₂
- HCN
- H₂S



Reactions in Aqueous Solutions

- An aqueous solution contains one or more substances dissolved in water
- These dissolved substances are called solutes
- In aqueous solutions, water is called the solvent.



Ionic vs. Molecular Solutes

- Molecular solutes, like sugar (s) and ethanol (l) are dissolved in water. They exist as _____.
- **molecules**
- Ionic solutes, like salt (s) or sodium hydroxide (s), also dissolve in water but they _____ into their ions!
- **dissociate** are molecular solutes that also dissociate into their ions as well!

Acids

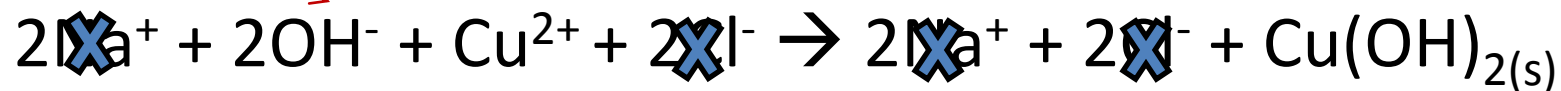
Aqueous Reactions and Ionic Equations

- Complete ionic equation – breaks up all aqueous ionic compounds into their ions!

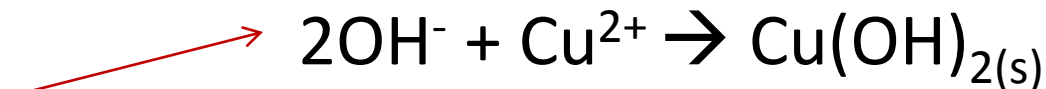


looks like

Complete ionic equation



If you see the same ion on both sides...cancel it out!!!

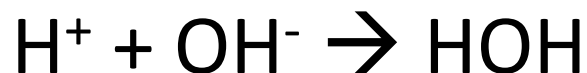
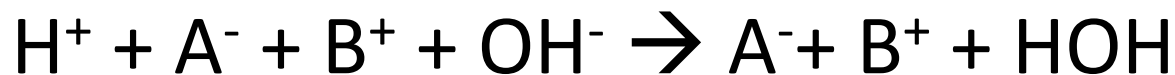


Net ionic equation

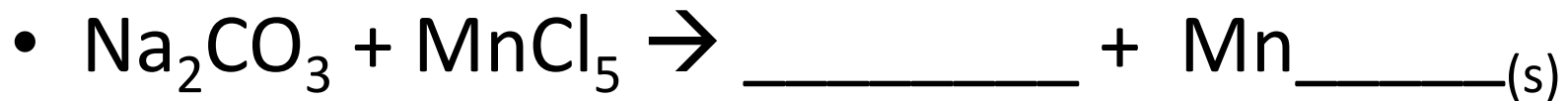
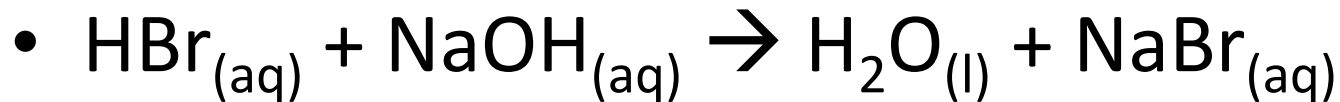
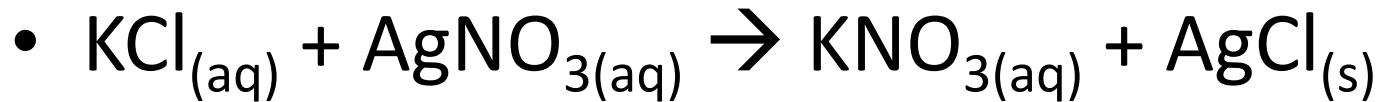
Net Ionic Equations

- Only break up ionic compounds. (Something you would notate as (aq)).
- Do NOT break up solids, liquids, or gases!

Neutralization reactions



Write the net ionic equation for...



Ionic Equations Practice

- Write chemical, complete ionic, and net ionic equations for the reaction between aqueous solutions of barium nitrate and sodium carbonate.
- 1. Use names and write formulas
- 2. Assemble the chemical equation
- 3. Determine the products and their states of matter
- 4. Break up into ions and write net ionic eqn.

Practice for You!

- Write the chemical, complete ionic and net ionic equations.
- Aqueous solutions of aluminum chloride and sodium hydroxide react.
- Aqueous solutions of lithium sulfate and calcium nitrate are mixed.
- Hydrofluoric acid reacts with lithium iodide.