

Chapter 9

Warm Up!

- How many atoms of each element are in the following



Name the above compounds

Draw the Lewis structures for CO_3^{2-} , NO_2 , PO_4^{3-}

Today's Agenda

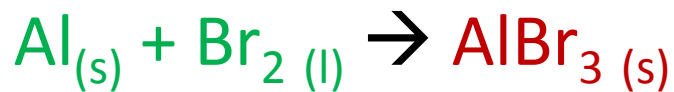
- QOTD: What is the correct way to write and balance a chemical equation
- Writing and balancing chemical equations
- Synthesis and combustion reactions
- Practice writing and identifying synthesis and combustion reactions.

Chemical Reactions

- When you eat, cook, or use household cleaners you are involved in some sort of chemical reaction!
- A chemical reaction is the process by which atoms rearrange to form a different substance.
- How do you know a chemical reaction has taken place?

Chemical Equations

- Equations show how the reactions goes from reactants (starting substances) to products (substances formed).
- Reactant 1 + Reactant 2 → Product 1 + Product 2
- Aluminum (s) + Bromide (l) → Aluminum bromide (s)

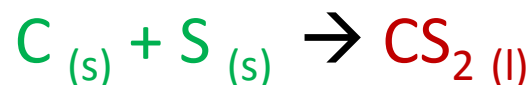


Remember your 7 diatomic elements!
H₂, N₂, O₂, F₂, Cl₂, Br₂, I₂

Writing Chemical Equations

- Given – carbon and sulfur are solids. They react to form carbon disulfide liquid.

Reactant 1 + Reactant 2 → Product 1 + Product 2



- Try these!

Hydrogen and bromine gases react to yield hydrogen bromide gas.

Carbon monoxide and oxygen gases react to form carbon dioxide gas.

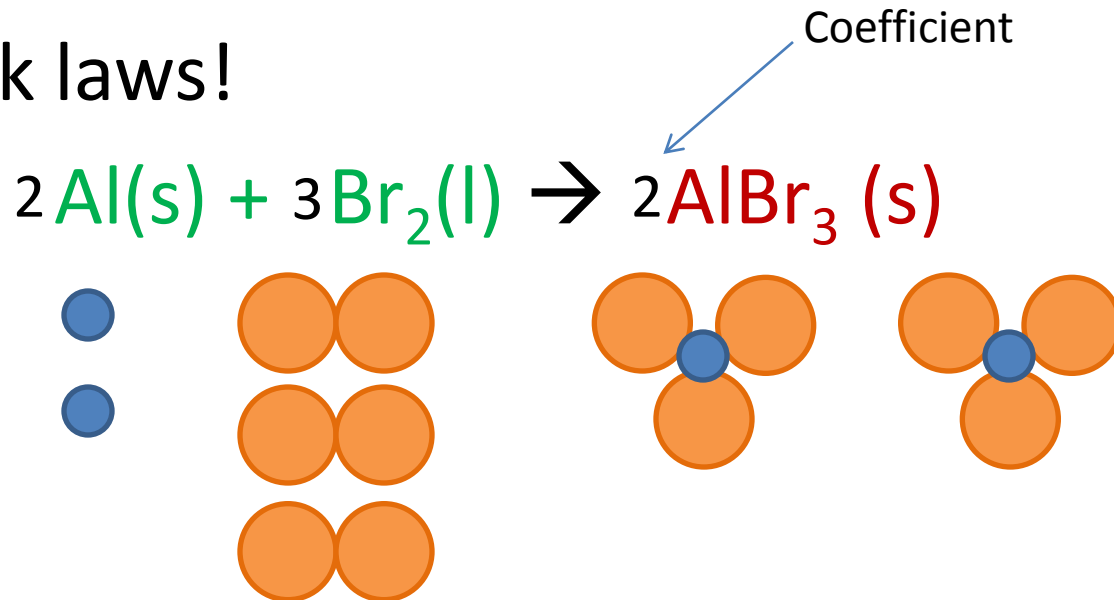
Solid potassium chlorate yields solid potassium chloride and oxygen gas

Now we BALANCE...



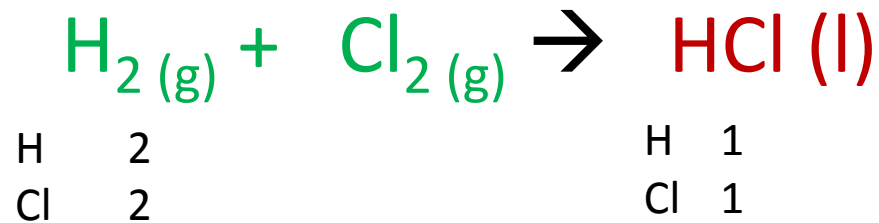
Law of conservation of mass says matter is neither created nor destroyed

So we need to make sure we don't break laws!

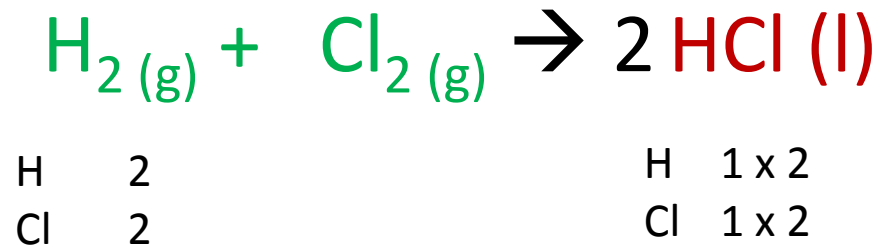


How to Balance

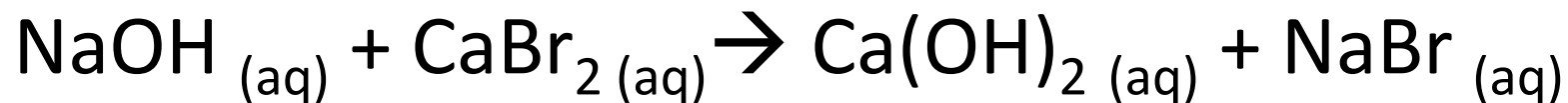
- Given: hydrogen gas reacts with chlorine gas to form the liquid hydrochloric acid.



Balance with coefficients so the totals are equal on either side



Balancing Practice



When you balance, keep polyatomic ions together!

Na	1
OH	1
Ca	1
Br	2

Na	1
OH	2
Ca	1
Br	1

Now you balance!

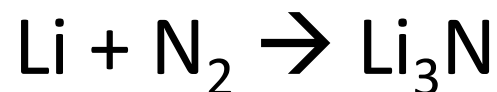
1. $\text{FeCl}_3 \text{ (aq)} + \text{NaOH} \text{ (aq)} \rightarrow \text{Fe(OH)}_3 \text{ (aq)} + \text{NaCl} \text{ (aq)}$
2. $\text{CS}_2 \text{ (l)} + \text{O}_2 \text{ (g)} \rightarrow \text{CO}_2 \text{ (g)} + \text{SO}_2 \text{ (g)}$
3. $\text{Zn} + \text{HNO}_3 \rightarrow \text{Zn(NO}_3)_2 \text{ (aq)} + ? \text{ (g)}$

Write the reaction and balance:

4. Potassium chromate reacts with lead nitrate in water. Potassium nitrate and the solid lead chromate is produced.

Warm Up

- When you balance a chemical equation, which numbers can you adjust? Which numbers are off limits? Why?
- Balance the following chemical equations

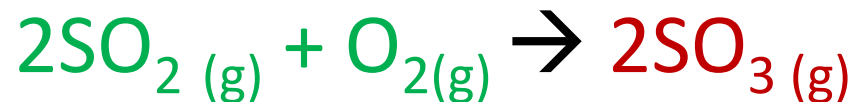


Agenda for Today

- QOTD: How can you identify the various types of different reactions?
- Synthesis Reactions
- Combustion Reactions
- Decomposition Reactions
- Displacement Reactions
- Practice!

Types of Reactions

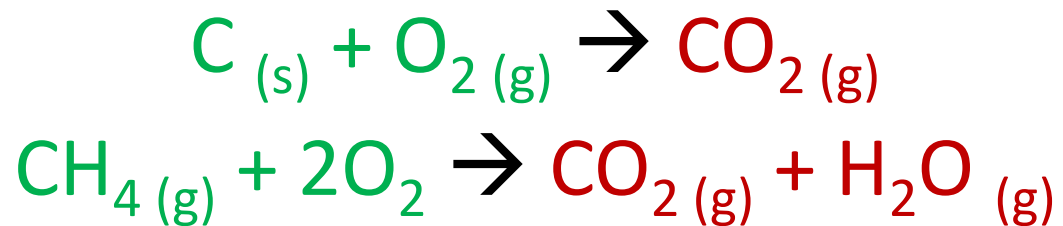
- Four main types: synthesis, combustion, decomposition, and replacement. (There are more but we won't worry about them)
- **Synthesis** reaction: two or more substances react to produce single product.



Types of Reactions

- **Combustion** – oxygen combines with a substance and releases heat and light.

Burning coal is a combustion reaction that creates usable energy!



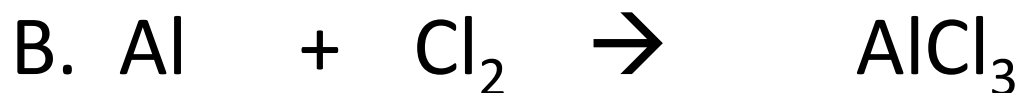
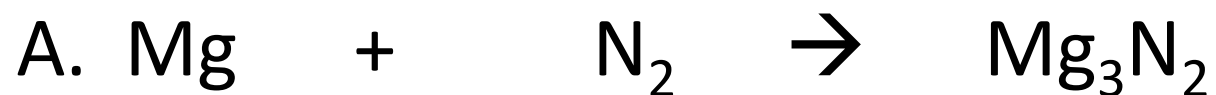
Can be called an **OXIDATION** reaction

Differentiate Reactions

- Write the balanced chemical equations and classify each as synthesis or combustion.
- The solids aluminum and sulfur react to produce solid aluminum sulfide.
- Water and dinitrogen pentoxide gas react yielding aqueous hydrogen nitrate
- The gases nitrogen dioxide and oxygen react to produce dinitrogen pentoxide gas.

Warm Up

Balance



Today's Agenda

- QOTD: How do we differentiate between all the different types of reactions?
- Decomposition
- Replacement Reactions

Types of Reactions

- **Decomposition** – a single compound breaks down into two or more elements or new compounds.



Usually these types of reactions require **heat** or **light** !



how airbags work!

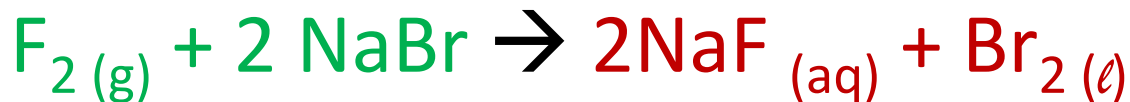
Types of Reactions

- **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 cannot replace any metals that lie above them on the activity series.

Fe will not replace Mn, Br will not replace F

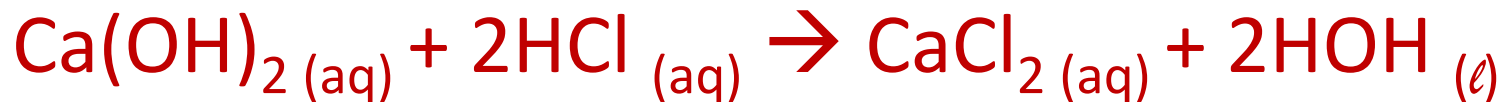
Two Activity Series		
Metals	Decreasing Activity	Halogens
lithium		fluorine
potassium		chlorine
calcium		bromine
sodium		iodine
magnesium		
aluminum		
zinc		
chromium		
iron		
nickel		
tin		
lead		
HYDROGEN*		
copper		
mercury		
silver		
platinum		
gold		

Practice

1. Aluminum oxide decomposes into aluminum metal and oxygen when electricity passes through it.
2. Nickel (II) hydroxide decomposes to produce nickel (II) oxide and water.
3. Iron reacts with copper (II) sulfate to yield iron(II) sulfate and copper metal.

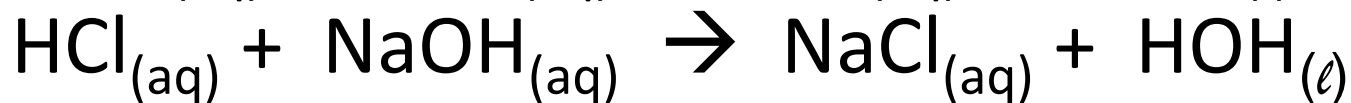
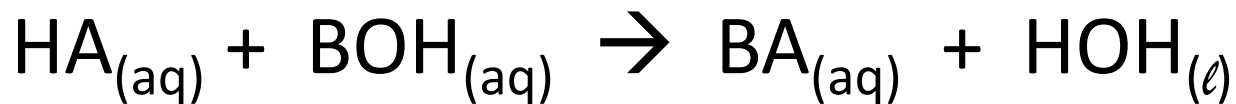
Types of reactions

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

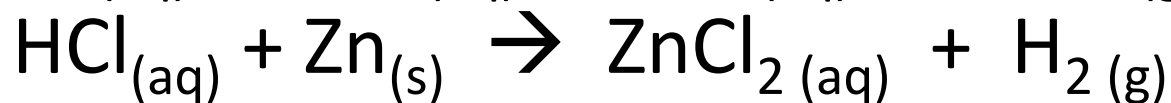


3 Types of Double Replacement

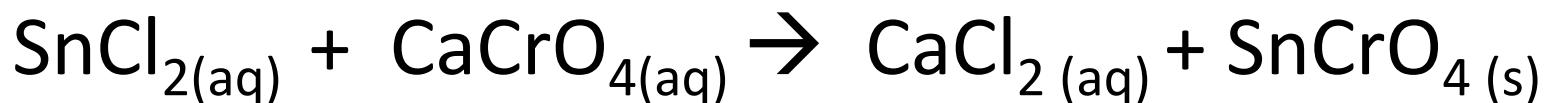
Acid/Base **Neutralization** –always produces water and soluble salt



Acid/salt or Acid/metal – forms gas



Salt/salt –When 2 soluble salts form a precipitate



Practice

- Aqueous lithium iodide and aqueous silver nitrate react to produce solid silver iodide and aqueous lithium nitrate.
- Aqueous barium chloride and aqueous potassium carbonate react to produce solid barium carbonate and aqueous potassium chloride.

Warm Up

- Write the formulas for

1. Barium chloride

2. Lithium sulfate

3. Barium sulfate

4. Lithium chloride

- Write and balance the chemical equation for



- Identify the type of reaction.

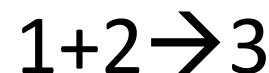
- Write the formulas for

1. Magnesium Oxide

2. Carbon Dioxide

3. Magnesium carbonate

- Write and balance the chemical equation for



- Identify the type of reaction.

Today's Agenda

- QOTD: NONE – Review formula writing and types of reactions!!
- Warm up and class problems
- Practice problems and finish homework worksheets.
- Wrap-up!!
- Start review for mid-year.