

Today (Tuesday 4/29)

- Take out homework, notebook & calculator please.
- Balancing chemical equations.
- Describing chemical reactions.
- Reactions in Aqueous Solutions.



Symbols in Reactions

- $+$: used to separate reactants and products.
- $\rightleftharpoons$: Used to denote a reversible reaction.

Symbols Continued

- Symbols that indicate that heat was used to facilitate the reaction:
 - $\xrightarrow{\Delta}$ & $\xrightarrow{\Delta \text{ Heat}}$
- If there is an element above the arrow then it was used as a catalyst .
 - $\xrightarrow{\text{H}_2\text{SO}_4}$

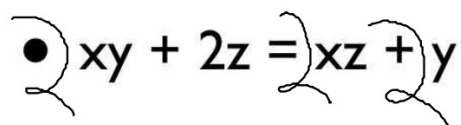
Heat is often needed to start a reaction.

This is because energy is needed to break bonds.

Once broken, chemicals recombine to form new materials.

Make both sides equal

- The rules are similar to algebra in that coefficients multiply.
- In chemistry we can change these coefficients to balance both sides of the equation.
- How would you balance the following:



$$xy + 2z = xz + y$$

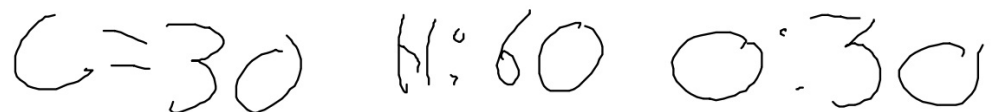
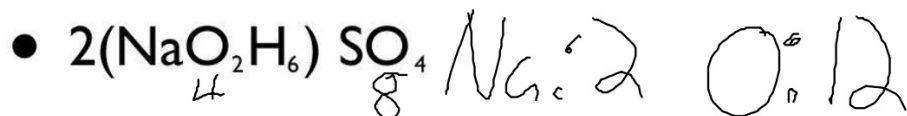
- I can change the coefficients.
- $(xy) + (2z) = (xz) + (y)$
- I need 2 z's on each side:
 - $(xy) + (2z) = 2(xz) + (y)$
- I now have 2 z's on both sides, but I also have 2 x's on the right side.
- $2(xy) + (2z) = 2(xz) + (y)$

$$2(xy) + (2z) = 2(xz) + (y)$$

- I now have equal numbers of x's and z's on both sides, but I have two y's on the left side.
- $2(xy) + (2z) = 2(xz) + 2(y)$
- I now have a balanced equation!

How many atoms?

- Chemical notation can be confusing.
- How many of each atom do you count?



Ch. 10 Quizzes

I will pass the quizzes back.

Check IC to make sure that the correct grade is posted.

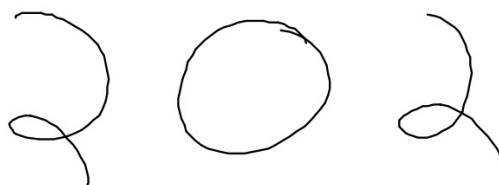
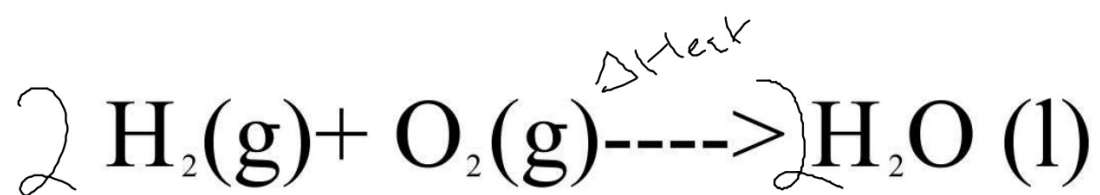
I will take questions in a moment.

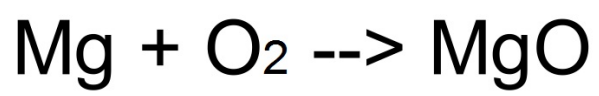
Conservation of Mass

- We have learned that **matter cannot be created or destroyed**. Neither can energy.
- Therefore we must be sure to balance both sides of chemical equations.

Balancing Equations

- Count the number of atoms of each element on either side of the arrow.
- If there is an imbalance:
 - Put a coefficient in front of one of the molecules so that it balances an element on both sides.
 - Did this create an imbalance in another element? Repeat...





Worksheet:

Count the number of atoms on each side of the reaction.

Determine if the reaction is balanced or unbalanced.

a: NO

b: NO

c: NO

d: NO

e: Yes

f: NO

g: Yes

h: Yes

i: Yes

Good Morning

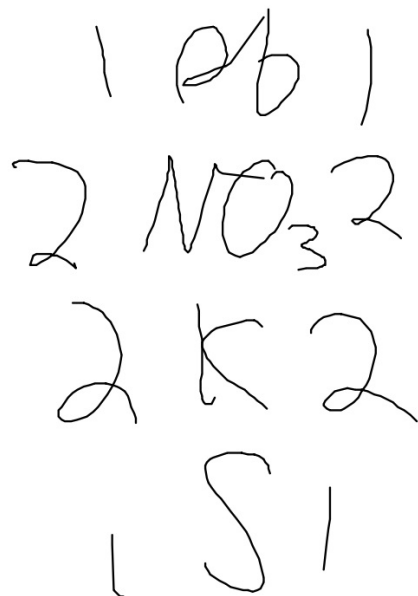
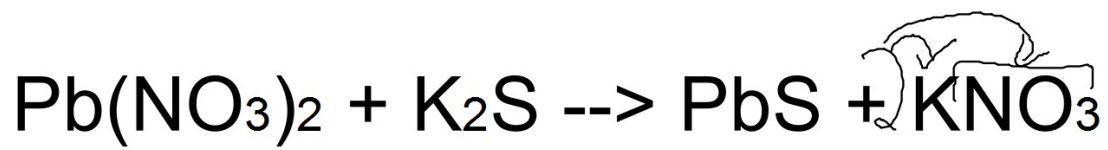
Please take out your notebook, pencil, periodic table and periodic table of ions.

Determine if the following equation is balanced:



If not, where would you put a coefficient?

Homework solutions by the chem hood.



Type of Reactions

Synthesis

- 1 • Combination/Composition Reaction:
 $A + B \rightarrow AB$. Ex: $Mg + O_2 \rightarrow MgO$
- 2 • Decomposition Reaction: $AB \rightarrow A + B$.
Ex: $Ag_2O \rightarrow Ag + O_2$
- 3 • Single Replacement Reaction:
 $AB + C \rightarrow AC + B$
Ex: $Fe + CuCl_2 \rightarrow Cu + FeCl_2$

Types Continued

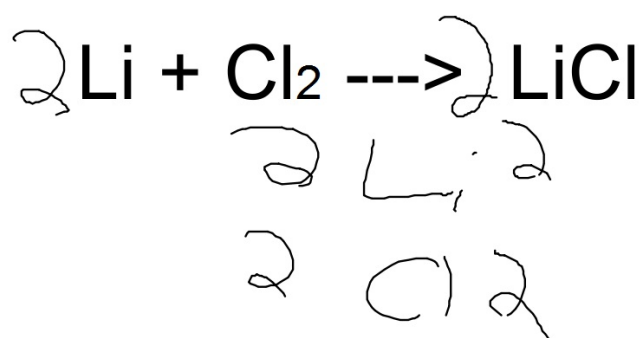
- Double Replacement Reactions: $AB + CD \rightarrow AC + BD$
Ex: $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{CO}_3$
- Combustion Reactions (Fire!):
“CH” (fuel) + $\text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{heat}$
- These will always have similar chemical make-ups.

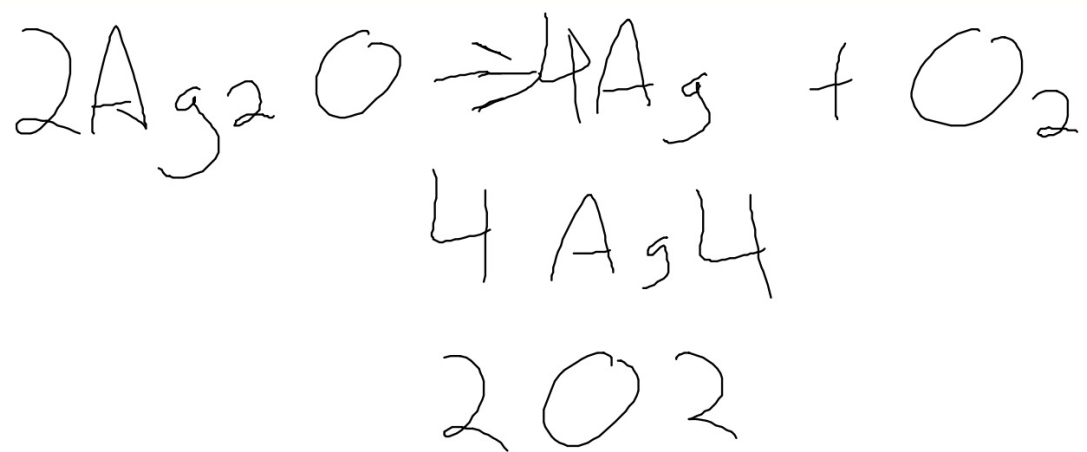
Combustion Reactions

- If Oxygen is limited, CO is formed.
- Sometimes C (soot) is formed. Less heat is produced in these reactions.
- Examples of “CH” fuels:
 - CH₄: “natural” gas, C₃H₈: propane, C₈H₁₈: Octane “gasoline”

Composition/Synthesis:

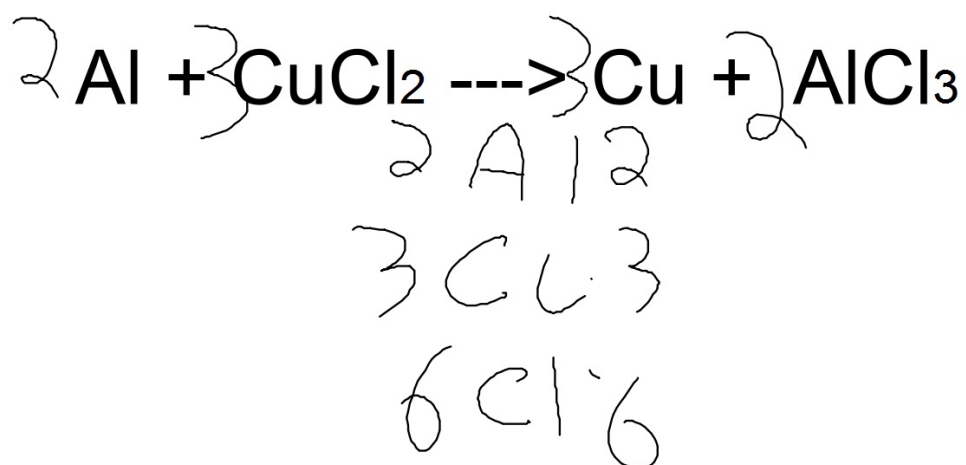
Two (or more) chemicals combine to form a new substance.



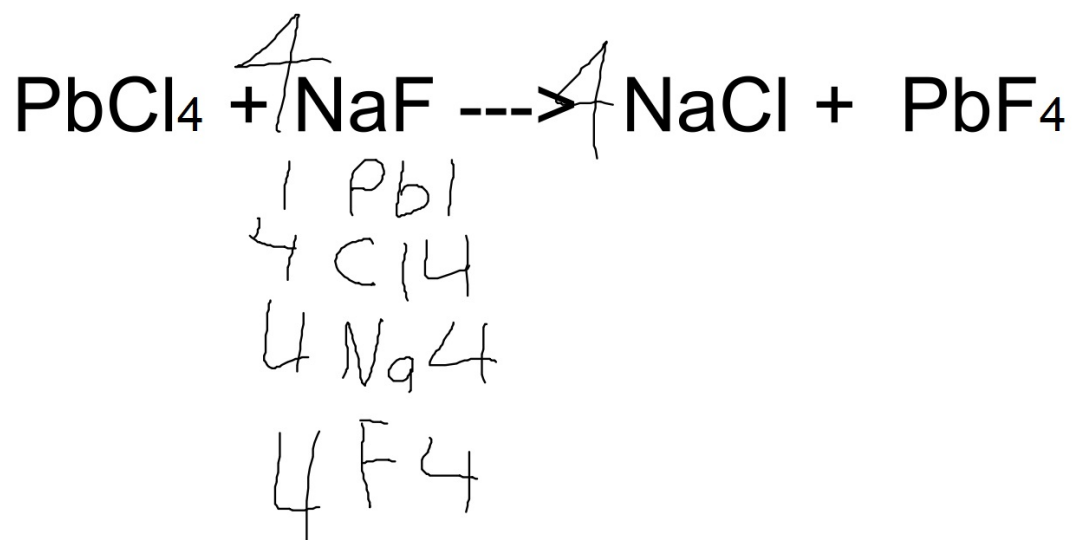


Decomposition

Single Replacement Reactions:
One chemical replaces another
in a compound.



Double Replacement Reactions:
Two compounds recombine by switching components to form two new compounds.

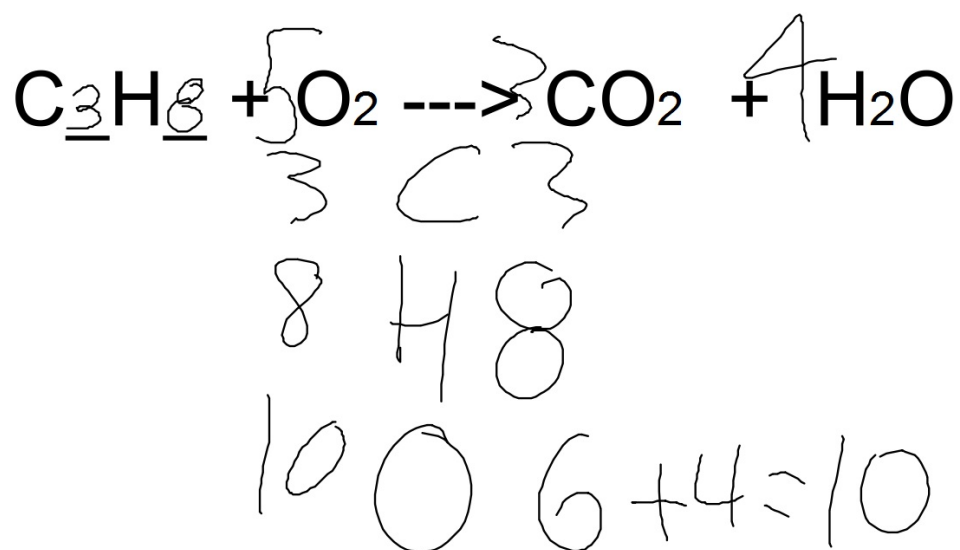


What are the elements that keep replacing each other?

Tell your partner what you think.

Metals

Combustion: The decomposition of hydrocarbons in oxygen gas to form carbon dioxide and water.



Words to symbols:

Take each chemical or compound and write it individually.

Balance all of the ionic compounds.
You now have a skeleton equation.

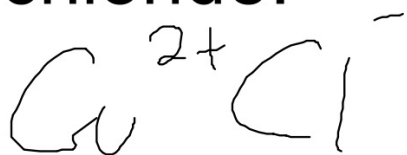
Now use coefficients to balance the number of atoms of each element in the reaction.

Things to have on hand:

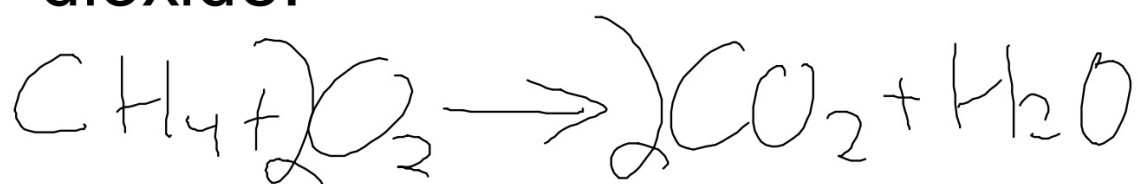
Periodic table of ions.

Naming compounds worksheet. If you cannot find this, there are more copies on school wires under chapter 9.

Copper(II) chloride and aluminum react to produce copper and aluminum chloride.



Methane burns in the presence of oxygen to form water and carbon dioxide.



Worksheet:

Do 1-5 and 16-19 with your partner.

We will discuss the answers in a few minutes.

Finish the worksheet for homework.

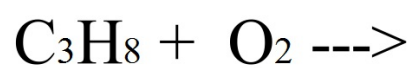
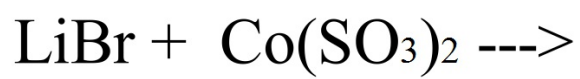
Predicting products:

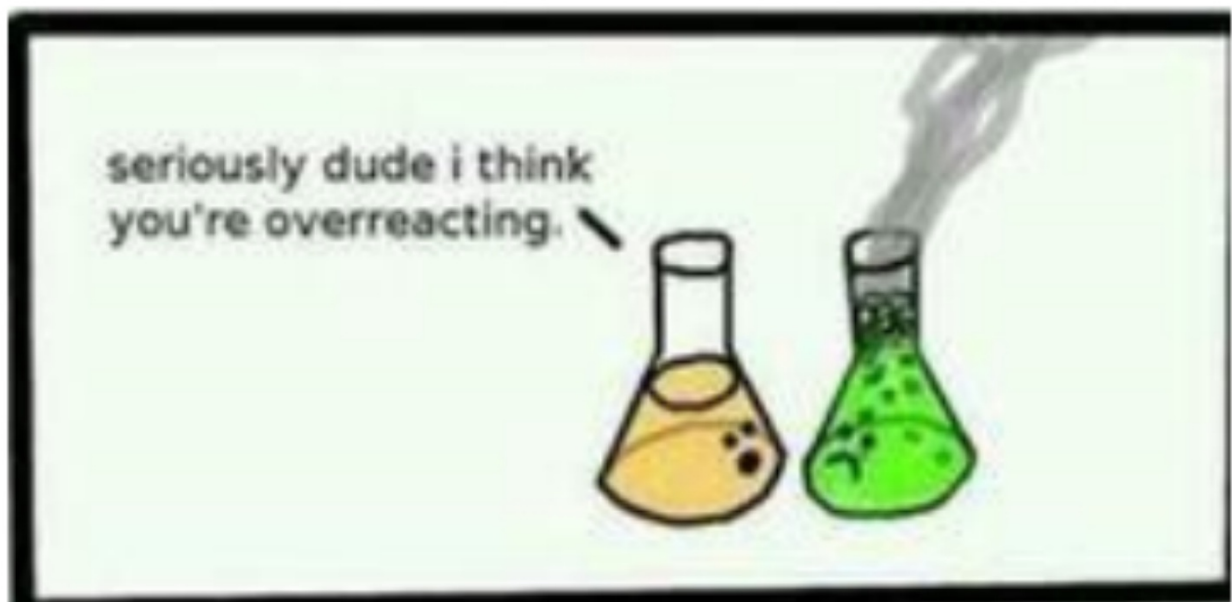
Look at the reactants.

See what can be switched out.

Make sure to balance all ionic compounds.

Remember, combustion produces water and carbon dioxide.





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You have the remainder of the period to work on the worksheet.

Work with your lab partner if you would like.

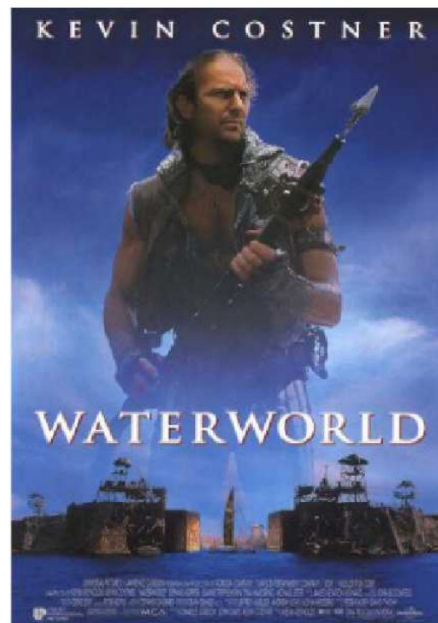
Please finish this overnight.



Aqueous Solutions

Our Water World

- Earth's surface is 70% water.
- The human body is about 66% water.



Aqueous Solutions

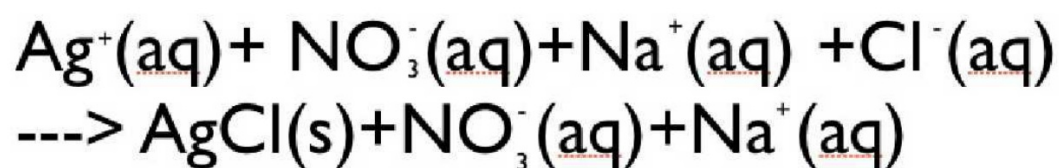
- Chemicals dissolved in water.
- Why do we do this?
 - It makes chemical reactions happen more easily.
 - We can create less hazardous concentrations of chemicals for reactions.

Net Ionic Equations

- Ionic compounds can be dissolved in water and dissociate. Think salt water.
- When this is written in chemical equations it looks like this: NaCl (aq) .
- This means that the Salt has separated “into” solution.
- Chemical reactions can happen much faster in when ions are separated.

Describing Ionic Eqns

- $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \text{ ----->}$
 $\text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$
- We have 4 total ions:
 - Ag, NO₃⁻, Na, and Cl.
 - Write them as separated ions in a chemical equation:
 - $\text{Ag}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
 $\text{---> AgCl}(\text{s}) + \text{NO}_3^-(\text{aq}) + \text{Na}^+(\text{aq})$



- What states of matter are present?
- What changes state?
- What remains the same?

Spectator Ions

- The ions not directly involved in the reaction.
- They have the same “state” on both sides of the equation.



Net Ionic Equation

- The equation that is left after the spectator ions are removed from the equation.
- $\text{Ag}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NO}_3^-(\text{aq}) + \text{Na}^+(\text{aq})$
- This becomes: $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$

