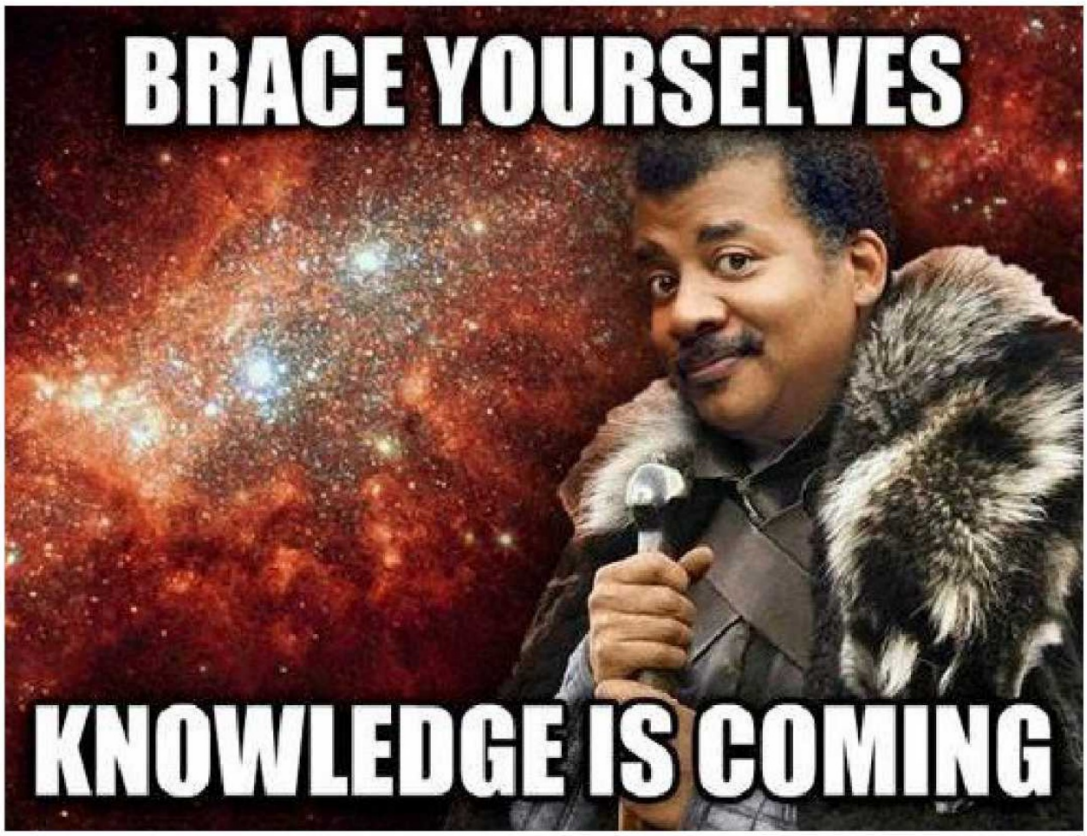
Today (Tuesday 4/29)

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


BRACE YOURSELVES
KNOWLEDGE IS COMING

Symbols in Reactions

- +: used to separate reactants and products.
- ⇌ : 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 .
  - $\xrightarrow{H_2SO_4}$

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

$xy + 2z = xz + y$

- I can change the coeffients.
- $(xy) + (2z) = (xz) + (y)$
- 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?
  - C_3PO C:3 P:1 O:1
  - $2(NaO_2H_6)\,SO_4$ Na:2 O:12
  - $5(C_6H_{12}O_6)$

    C=30 H:60 O:30

Ch. 10 Quizzes

I will pass the quizzes back.

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

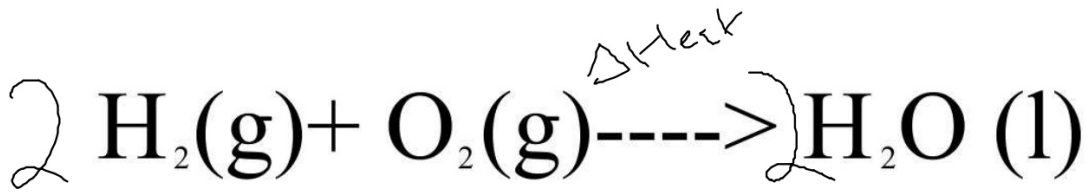
I will take questions in a moment.

Conservation of Mass

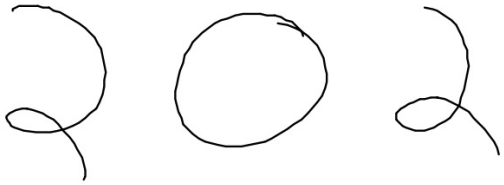
- We have learned that **matter cannot be created or destroyed**. Neither can energy.
- Therefore we must be sure to balance both sides of chemical equations.

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...


ΔHrxn
2 H2(g)+ O2(g)----->2H2O (l)


4 H 4

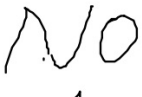

2 O 2

$Mg + O_2 \rightarrow MgO$

Worksheet:

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

Determine if the reaction is balanced or unbalanced.

a: 
b: 
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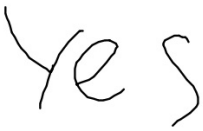
i: 

Good Morning

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

Determine if the following equation is balanced:

$Pb(NO_3)_2 + K_2S \rightarrow PbS + KNO_3$

If not, where would you put a coefficient?

Type of Reactions

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

Types Continued

- Double Replacement Reactions: AB +CD---->AC+BD
  Ex: $NaHCO_3$ +HCl--->NaCl+ H_2CO_3
- Combustion Reactions (Fire!):
  "CH" (fuel)+ O_2 ---> CO_2 +H_2O+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:
  - CH_4: "natural" gas, C_3H_8: propane, C_8H_{18} : Octane "gasoline"

Composition/Synthesis:
Two (or more) chemicals combine to form a new substance.

$Li + Cl_2 \rightarrow LiCl$

Decomposition:
Chemicals break apart (disassociate).

Ag_2O ----> Ag + O_2

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

$Al + CuCl_2 \rightarrow Cu + AlCl_3$

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

$PbCl_4 + NaF \rightarrow NaCl + PbF_4$

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

$C\_H\_ + O_2 \text{---> } CO_2 + H_2O$

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.

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.

Pedicting products:

Look at the reactants.

See what can be switched out.

Make sure to balance all ionic compounds.

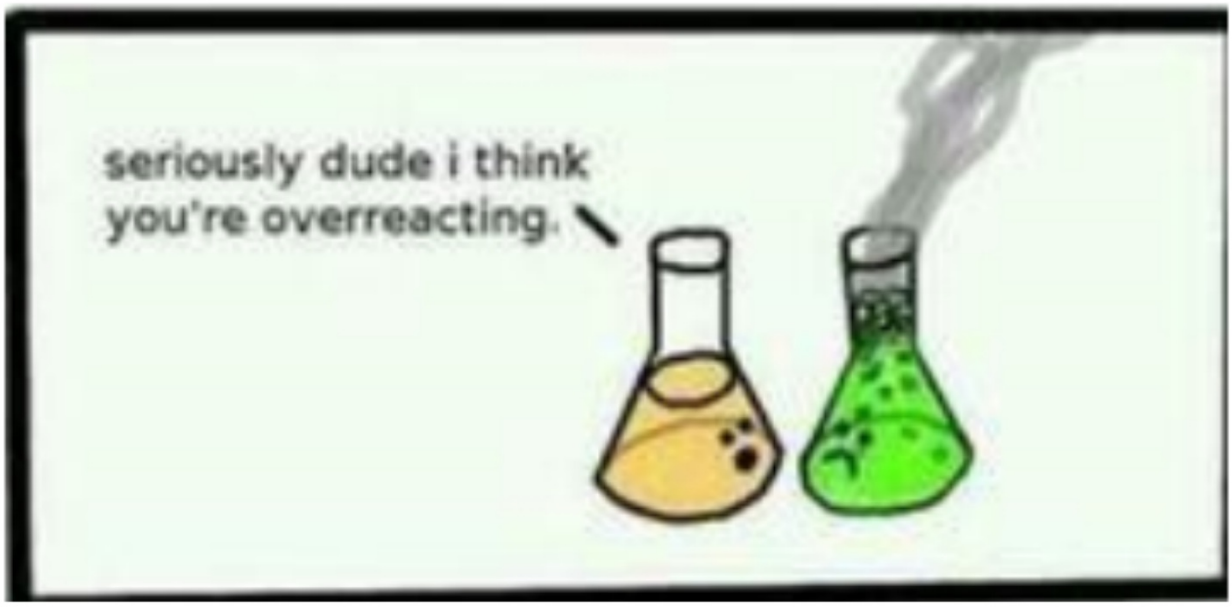
Remember, combustion produces water and carbon dioxide.

$Ag + CuSO_4 \rightarrow$

$NaI + CaCl_2 \rightarrow$

$LiBr + Co(SO_3)_2 \rightarrow$

$C_3H_8 + O_2 \rightarrow$



kahoot.it

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

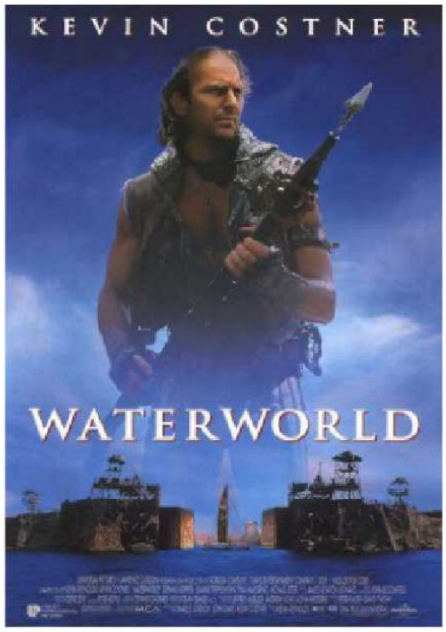
Work with your lab partner if you would like.

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

- $AgNO_3(aq)$ + $NaCl(aq)$ -----> $AgCl(s)$ + $NaNO_3(aq)$
- We have 4 total ions:
  - Ag, NO_3, Na, and Cl.
  - Write them as separated ions in a chemical equation:
  - $Ag^+(aq)+ NO_3^-(aq)+Na^+(aq) +Cl^-(aq)$ ---> $AgCl(s)+NO_3^-(aq)+Na^+(aq)$

$$Ag^{+}(aq) + NO_3^{-}(aq) + Na^{+}(aq) + Cl^{-}(aq) \longrightarrow AgCl(s) + NO_3^{-}(aq) + Na^{+}(aq)$$

- 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.
- $Ag^{+}(aq) + NO_3^{-}(aq) + Na^{+}(aq) + Cl^{-}(aq) \rightarrow AgCl(s) + NO_3^{-}(aq) + Na^{+}(aq)$
- This becomes: $Ag^{+}(aq) + Cl^{-}(aq) \rightarrow AgCl(s)$