CHEMICAL EQUATIONS

- are the "recipes" in chemistry
- show the substances going into a reaction, substances coming out of the reaction, and give other information about the process

"yields"

$$MgCl_2(aq) + 2AgNO_3(aq) \longrightarrow 2AgCl(s) + Mg(NO_3)_2(aq)$$

REACTANTS - materials that are needed for a reaction

PRODUCTS - materials that are formed in a reaction

COEFFICIENTS - give the ratio of molecules/atoms of one substance to the others

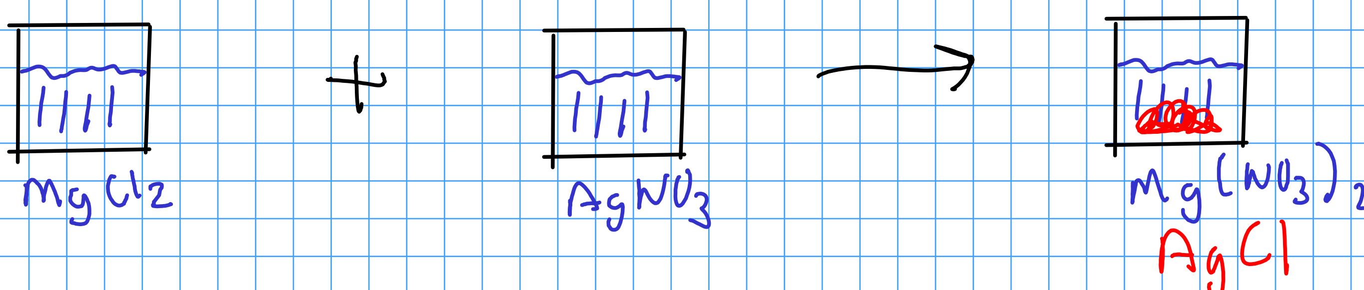
PHASE LABELS - give the physical state of a substance:

(s) -solid

(l) - liquid

(g) - gas

(aq) - aqueous. In other words, dissolved in water



CHEMICAL EQUATIONS

$$2\,Mg_{(s)} + O_{2\,(g)} \xrightarrow{\Delta} 2\,MgO_{(s)}$$

REACTION CONDITIONS - give conditions necessary for chemical reaction to occur. May be:

- Δ apply hear
- catalysts - substances that will help reaction proceed faster
- other conditions, such as required temperatures

- Reaction conditions are usually written above the arrow, but may also be written below if the reaction requires several steps or several different conditions

COEFFICIENTS

- Experimentally, we can usually determine the reactants and products of a reaction

- We can determine the proper ratios of reactants and products WITHOUT further experiments, using a process called BALANCING

- BALANCING a chemical equation is making sure the same number of atoms of each element go into a reaction as come out of it.

- A properly balanced chemical equation has the smallest whole number ratio of reactants and products.

- There are several ways to do this, but we will use a modified trial-and-error procedure.

BALANCING

$$C_3H_8 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

6 4

10 10

1. Pick an element. Avoid (if possible) elements that appear in more than one substance on each side of the equation.

2. Change the coefficients on substances containing this element so that the same number of atoms of the element are present on each side. CHANGE AS LITTLE AS POSSIBLE!

3. Repeat 1-2 until all elements are done.

4. Go back and quickly VERIFY that you have the same number of atoms of each element on each side, If you used any fractional coefficients, multiply each coefficient by the DENOMIMATOR of your fraction.

Use SMALLEST WHOLE NUMBER RATIOS!

BALANCING

$3MgCl_2 + 2Na_3PO_4 \longrightarrow Mg_3(PO_4)_2 + 6NaCl$ ✓

$C_2H_2 + \frac{5}{2}O_2 \longrightarrow 2CO_2 + H_2O$

4 + 1 = 5

To get a single oxygen atom from O2, we need 1/2 of an O2. So, to get 5 oxygen atoms, we need 5/2 O2.

To get rid of the fraction 5/2, multiply ALL COEFFICIENTS by the denominator of the fraction (2).

$2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O$ ✓

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$ ✓

4 H   4 H

6 O   6 O