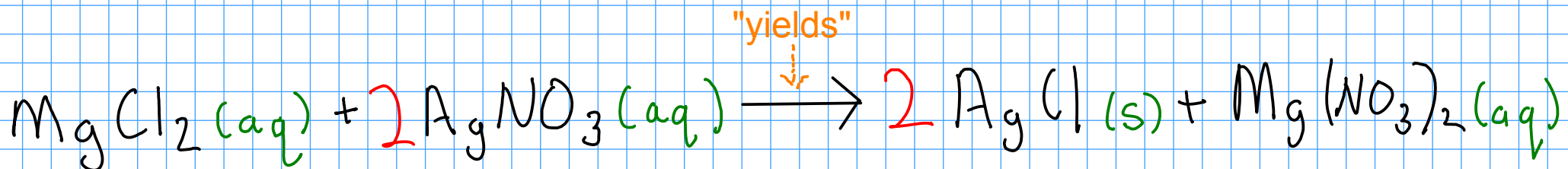


CHEMICAL EQUATIONS

- 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



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

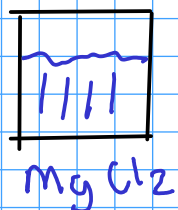
PHASE LABELS - give the physical state of a substance:

(s) - solid

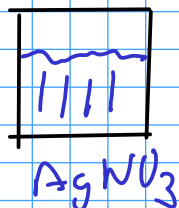
(l) - liquid

(g) - gas

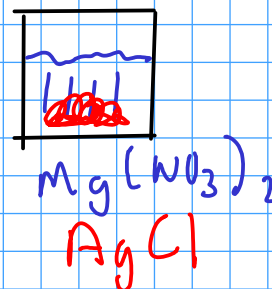
(aq) - aqueous. In other words, dissolved in water



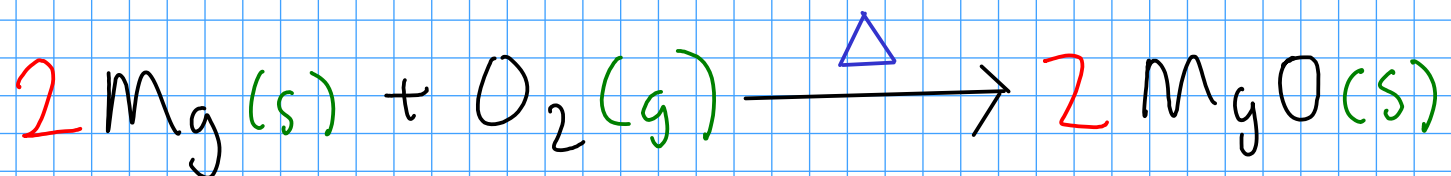
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CHEMICAL EQUATIONS



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

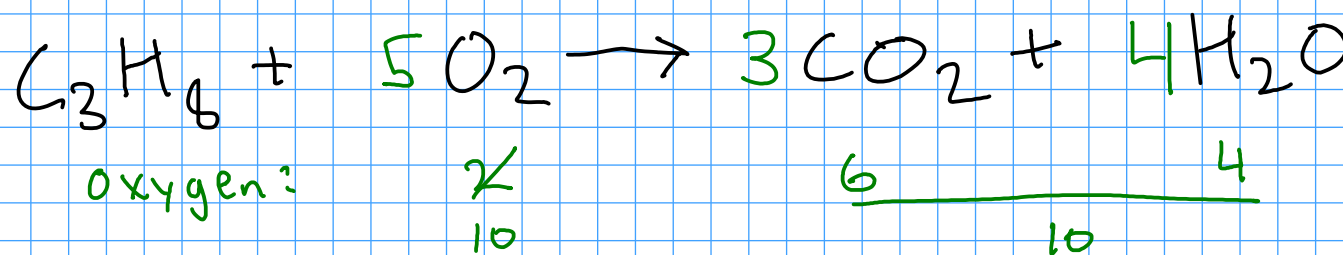
- Δ apply heat
- catalysts - substances that will help reaction proceed faster
- other conditions, such as required temperatures

- 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



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

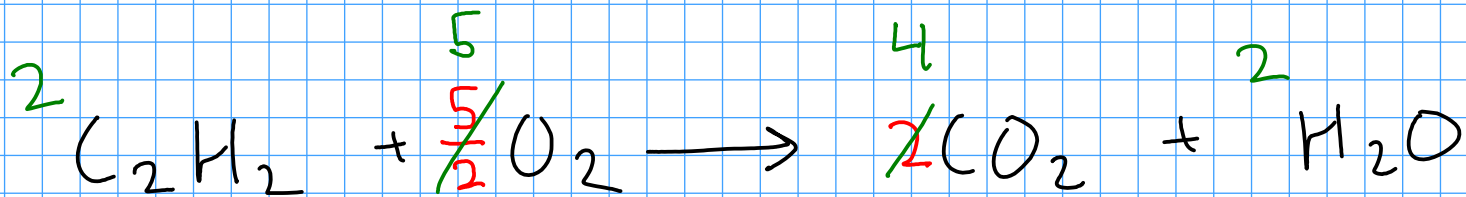
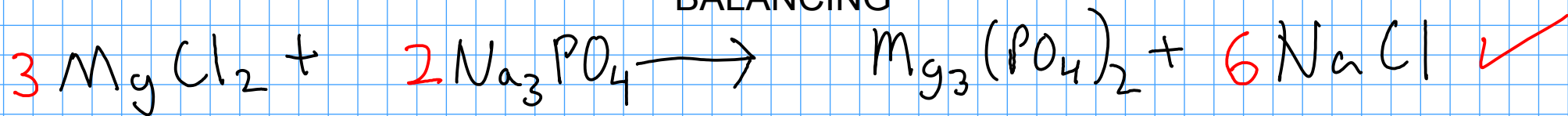
② Change the coefficients on substances containing this element so that the same number of atoms of the element are present on each side. **CHANGE AS LITTLE AS POSSIBLE!**

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 **DENOMINATOR** of your fraction.

Use SMALLEST WHOLE NUMBER RATIOS!

BALANCING



oxygen: $\frac{2}{5}$ $\frac{4}{5}$ $\frac{1}{5}$

To get one oxygen atom from O_2 , you need $1/2$ of an O_2 . To get five oxygen atoms from O_2 , you need $5/2 \text{O}_2$!

Multiply ALL coefficients by 2 to get the smallest WHOLE NUMBER RATIO!

