In an equation, what do coefficients represent?

$$2H_2(g) \quad + \quad O_2(g) \quad \Rightarrow \quad H_2O(g)$$

molecules

moles

$$2KClO_3\ (s) \quad \Rightarrow \quad KCl(s) \quad + \quad 3O_2(g)$$
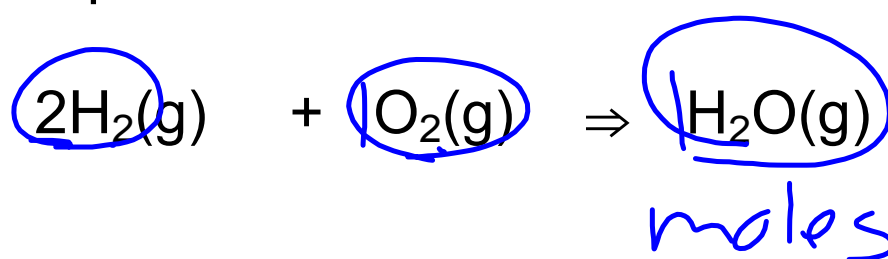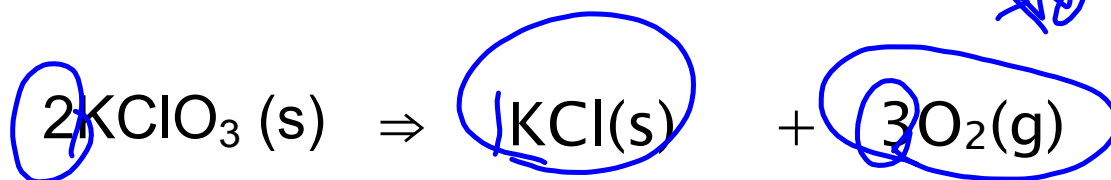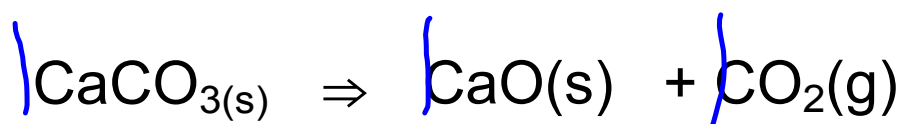
factor.

Back to Stoichiometry...

Calcium Carbonate decomposes to Calcium Oxide and carbon dioxide when heated;

If a 50.g sample of calcium carbonate is heated, how much Calcium oxide will be produced?

$$CaCO_{3(s)} \Rightarrow CaO(s) + CO_2(g)$$

GFM of $CaCO_3$ is 100.0 g/mol;
            CaO is 56.0 g/mol

$CaCO_{3(s)} \Rightarrow CaO(s) + CO_2(g)$

GFM of $CaCO_3$ is 100.0 g/mol;
        CaO is 56.0 g/mol

Ratio of $CaCO_3$ to CaO = $\dfrac{1\ mol\ CaCO_3}{1\ mol\ CaO}$

50.0 g. $CaCO_3$ x 1.00 mol $CaCO_3$/100 g $CaCO_3$

            =   0.500 mol $CaCO_3$

∴ you should produce 0.500 mol CaO!

0.500 mol CaO x 56.0g CaO/1.00molCaO =

            28.0 g CaO

This is called a Mass-Mass Problem
Rules:
1. Write a balanced equation

2. Find the ratio of known moles to unknown moles

3. Compute the number of known moles

4. Calculate the number of unknown moles using step 2

5. Using the GFM, compute the mass of the unknown

How many grams of Sodium Chloride must be decomposed to yield 355 g of Chlorine gas?

$2NaCl(s) \Rightarrow 2Na(s) + Cl_{2(g)}$

Balance:

Molar ratio: $1 \, mol \, Cl_2 : 2 \, mol \, NaCl$

Moles Known: $355 \, g \, Cl_{2(g)} \cdot \dfrac{1 \, mol \, Cl_2}{71 \, g \, Cl_2}$

Ratio: $5 \, mol \, Cl_2 \cdot \dfrac{2 \, mol \, NaCl}{1 \, mol \, Cl_2}$

Grams Unknown:
$10 \, mol \, NaCl \cdot \dfrac{58.5 \, g \, NaCl}{1 \, mol \, NaCl}$