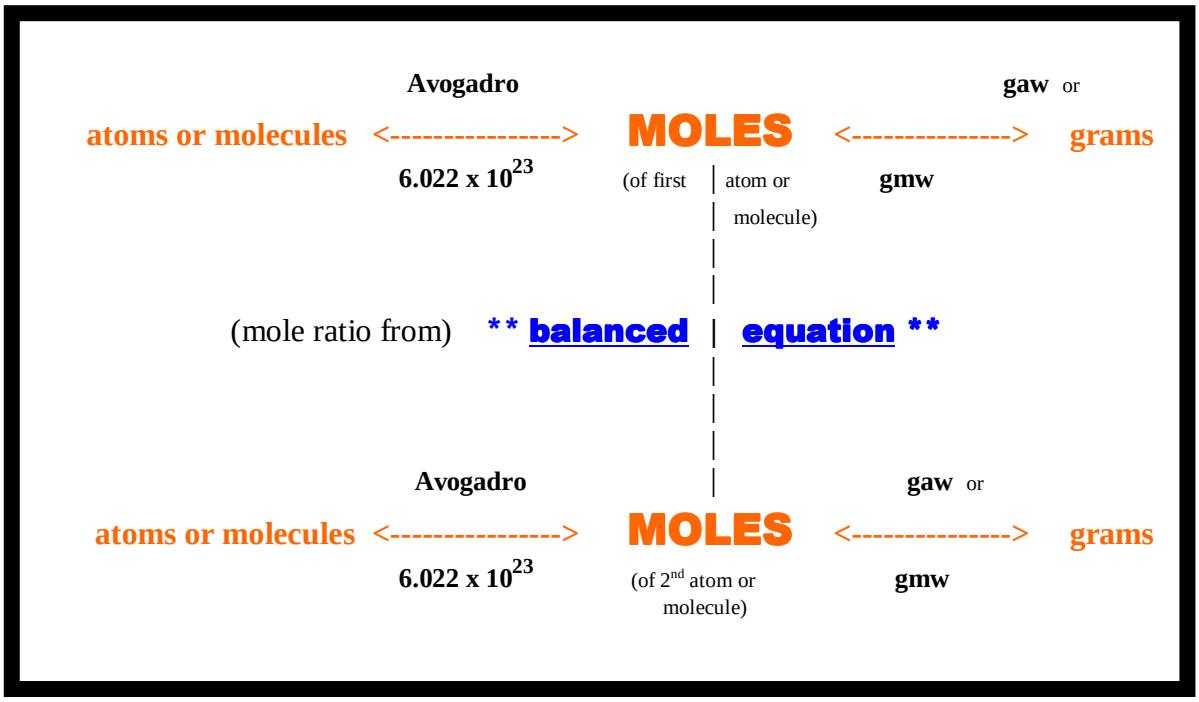
Tutorial – Mass <----> mole conversions Std 3e

You have a great web site in my web helps to give you this same information in a slightly different way. Take a look at it now by clicking on Mole <---> grams conversion tutorial . Here I will go through what we have done in DO NOW's.

I am going to add something to the diagram you find at that website. So the complete diagram will give you everything you need for solving the problems below. Remember it takes **avocadoes to make guacamole** from atoms or molecules.



Why the MOLES two times? If you start with moles of one kind of molecule or atom and need to change to moles of a different molecule or atom, you use the mole ratio from the chemical equation to make the change.

PROBLEM 1

If you are give 8 grams of H_2 , how many grams of O_2 will you need to burn up all 8 grams of H_2 for the following balanced chemical equation:

$$2\,H_2 + O_2 \text{ -----> } 2\,H_2O$$

Solution:

First look at the balanced equation and the mole ratios:

$$2\,H_2 + O_2 \text{ -----> } 2\,H_2O$$

mole ratios **2 : 1 : 2**

This tells you how many moles of O_2 will be needed for each mole of H_2 you have. But, we were given grams of H_2 so we have to change from grams to moles before we can use the mole ratio. So we use the gmw (gram molecular weight) of H_2 to do that. The gmw of H_2 can be retrieved from the periodic table

2 H's x 1g = 2 g for the gmw of H_2 because there are two atoms in the molecule.

8 g H_2	1 mole H_2				
1	2 g H_2				

With this step, we went from grams to MOLES on our diagram. But we need the moles of O_2 not H_2 . This is the step that requires the extra MOLES I put into the diagram above. Now it's time to cancel the units we can and also change moles of H_2 to moles of O_2 . For that we need to use the **mole ratio for the balanced equation.**

8 ~~g H_2~~	1 ~~mole H_2~~	1 mol O_2			
1	2 ~~g H_2~~	2 ~~mol H_2~~			

Now that we are in moles of O_2 we need to take the last step and convert to grams of O_2 . For that we use the gmw of O_2 which is 2 O x 16g = 32g which is also equal to 1 mole.

8 ~~g H_2~~	1 ~~mole H_2~~	1 ~~mol O_2~~	32 g O_2	**Answer**	**64 g O_2**
1	2 ~~g H_2~~	2 ~~mol H_2~~	1 ~~mole O_2~~		

PROBLEM 2

If you are given 96.1 g C_3H_8 . You are asked to find out how many grams of O_2 will be needed to burn up all of the 96.1 g of C_3H_8 , given the following **unbalanced** chemical equation:

$$C_3H_8 + O_2 \text{ -----> } CO_2 + H_2O$$

Solution:

Your first task is to **balance the equation**. If you do not balance the equation, you will not know the mole ratios of the reactants and products and will not be able to convert from moles of C_3H_8 to moles moles of O_2 , which is the 3rd step in the solution of this problem.

$$C_3H_8 + 5\ O_2 \text{ -----> } 3\ CO_2 + 4\ H_2O$$

mole ratio **1 : 5 : 3 : 4**

We will need the gmw (gram molecular weight) of both C_3H_8 and O_2

3 C x 12g = 36 g
8 H x 1 g = 8 g
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44 g/mole C_3H_8

2 O x 16g = **32 g/mole of O_2**

The last piece to our puzzle is the mole ratio of C_3H_8 : O_2 given to us by the balanced formula:

1 mole C_3H_8 = 5 mole O_2

96.1 g C_3H_8	1 mol C_3H_8	5 mol O_2	32 g O_2		
1	44 g C_3H_8	1 mol C_3H_8	1 mol O_2		

Now do the **unit cancellation**, multiply all the numbers left on the top, multiply all the numbers together from the 2nd row and divide the 2nd row into the top row number

96.1 ~~g C_3H_8~~	1 ~~mol C_3H_8~~	5 ~~mol O_2~~	32 g O_2	**Answer**	**348 g O_2**
1	44 ~~g C_3H_8~~	1 ~~mol C_3H_8~~	1 ~~mol O_2~~		