	SHS LEARNING ACTIVITY	CHEM1-06-03

Name: _____ **Score/Mark:** _____
Grade and Section: _____ **Date:** _____
Strand: ☐ **STEM** ☐ **ABM** ☐ **HUMSS** ☐ **ICT (*TVL Track*)**
Type of Activity : ☐Concept Notes ☐Skills: Exercise/Drill ☐Illustration
☐Laboratory Report ☐Essay/Task Report ☐Other: _____
Activity Title: 06-03.Moles and molar masses v02
Learning Target: To practice balancing equations
Authors|References: Victor Sojo | Wikipedia: Molar mass.

Since atoms are so incredibly small, we need some way to count them easily. But what number to use? A dozen? Still too few… Someone had a simple idea: since hydrogen is the first element, and we normally weigh things in grams, let's just define 1 mol ("one **mole**") as the number of atoms of hydrogen in 1 g of pure ^{1}H hydrogen. That was a great idea, but hydrogen is volatile and flammable and difficult to purify, so we now define mole as the number of carbon atoms in 12 g of pure ^{12}C (without any ^{13}C or ^{14}C). This value, called Avogadro's number (in honor of Italian chemist Amedeo Avogadro), is approximately **$6.02 \cdot 10^{23}$**.

So, 1 mol of ^{12}C weighs exactly 12 g. But since there's a bit of ^{13}C and ^{14}C in typical carbon, 1 mol of normal pure carbon actually weighs 12.011 g.

This is called the **molar mass** of carbon. The standard symbol is M, but we will use that later for "molarity" (the concentration of a solution), so here we will use the Greek letter μ ("mu") instead.

We can easily calculate the molar mass of compounds, such as CO_2:

$$\mu_{CO_2} = \mu_C \cdot 1 + \mu_O \cdot 2$$
$$= 12.011 \text{ g/mol} + 2 \cdot 15.999 \text{ g/mol}$$
$$= 44.009 \text{ g/mol}$$

Since most molar masses are so close to integers, we often round them (12, 16, and 44 in the calculation above). But some are too far to round up or down; for example, μ_{Cl} = 35.45 g/mol, which shouldn't really be rounded to either 35 or 36, so we just leave it as is or round only to 35.5 g/mol.

If you've heard the term "molecular weight" before, we won't use it here, firstly because it's not a weight (it's a mass), and secondly because it isn't always a molecule, as in some of the examples below.

Exercise. Calculate the molar masses of: H_2O, NaCl, $(NH_4)_2HPO_4$, C_2H_5OH.