The mole, M$_r$, M.

- To calculate masses of products and reactants using *balanced* chemical equations we use a unit called **mole**. One mole of a substance is the amount whose mass equals the molecular or atomic weight (in atomic mass units, amu) of the substance **expressed in grams**. This means that molecular weight of any substance in amu (from periodic table) is equal to molar weight (mass) in grams. Look at the periodic table (look for atomic weights), 12 grams of Carbon (C) equal 1 mole of Carbon and contains 6.022 10^{23} atoms of Carbon; 63. 5 grams of Cu equal 1 mole of Cu and contains 6.022 10^{23} atoms of Cu; 40 grams of Argon equal 1 mole of Ar and contains 6.022 10^{23} atoms of Ar etc.

One mole is the amount of substance that contains the same number of particles (atoms, ions, molecules etc.) as there are carbon atoms in 12 g of carbon 12
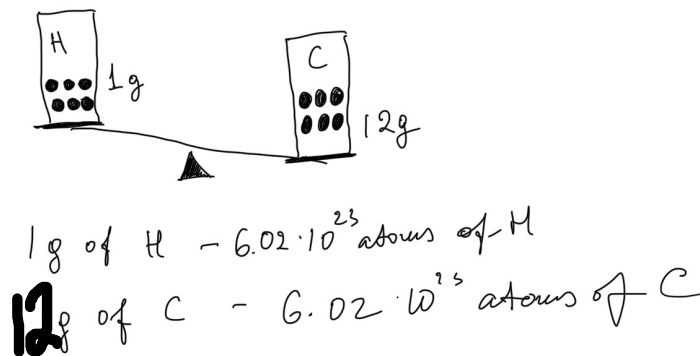
- *A mole of anything has 6.022 x 10^{23} particles*. This is called Avogadro's number, after Amedeo Avogadro, who first suggested that equal volumes of gas have equal numbers of molecules.

    - Knowing relative atomic weights (A$_r$)we can calculate relative molecular mass M$_r$ of the molecules.

M$_r$ is the sum of the relative atomic masses of the individual atoms making up a molecule.

What is relative molecular mass of methane?

CH_4

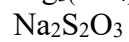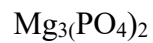12.04 (A_r of C) + 4x1.01 (A_r of H) = 16.08

What is relative molecular mass of magnesium chloride?

$MgCl_2$

24.3 + 35.5x2 = 95.3

Questions:

1. Work out the relative molecular masses (M_r) of the following compounds:

C_2H_5OH
PCl_5
$Mg_3(PO_4)_2$
$Na_2S_2O_3$

2. Calculate how many grams of Ca you have to take to have 1mole of calcium.
3. Calculate how many grams of gold you have to take to have 1mole of gold.