STOICHIOMETRY

Stoichiometry is a study of the mathematical relationships that exist in a chemical reaction

Introducing the **MOLE!!!!**

The mole is a chemistry unit that is used to measure the amount of a substance that is present. It is a way of counting molecules that makes sense.

1 mole is 6.022×10^{23} atoms or molecules

Therefore 1 mol = 6.022×10^{23} molec
1 mol = 6.022×10^{23} atoms

Mass Mole Relationships:

Using the average atomic masses on the periodic table, one can calculate the mass of one mole of any substance (provided you are given the formula)

eg $C_6H_{12}O_6$

C:	6	x	12.01	=	72.06
H:	12	x	1.01	=	12.12
O:	6	x	16.00	=	96.00

180.18 g/mol

eg H_2O (i.e. water)

H:	2	x	1.01	=	2.02
O:	1	x	16.00	=	16.00

18.02 g/mol

eg $K_4Fe(CN)_6 \bullet 4H_2O$

K:	4	x	39.10	=	156.40
Fe:	1	x	55.85	=	55.85
C:	6	x	12.01	=	72.06
N:	6	x	14.01	=	84.06
H:	8	x	1.01	=	8.08
O:	4	x	16.00	=	64.00
					440.45 g/mol

Using the above three examples one can write that:

$$1 \text{ mol } C_6H_{12}O_6 = 180.18 \text{ g } C_6H_{12}O_6$$

$$1 \text{ mol } H_2O = 18.02 \text{ g } H_2O$$

$$1 \text{ mol } K_4Fe(CN)_6 \bullet 4H_2O = 440.45 \text{ g } K_4Fe(CN)_6 \bullet 4H_2O$$

Volume Mole Relationship for a Gas at S.T.P.

This works only for a gas and the gas must be at S.T.P. conditions.

S. Standard
T. Temperature (273.15 K or 0 °C)
P. Pressure (1 atm or 101.325 kPa)

1 mol (any gas) = 22.414 L (any gas)

Summary:

1 mol = 6.022×10^{23} molec or atoms

1 mol = x g (where x depends on the chemical formula)

1 mol = 22.414 L for a gas at S.T.P.

Conversions:

In the study of stoichiometry conversion factors are used to change between mass, amount and volume

mass ➜ measured in g
volume ➜ measured in L (mL)
amount ➜ measured in mol

We will make conversion factors to suit our own immediate needs (design your own conversion factors)

- numerator and a denominator (hey it's a fraction
- the numerator and denominator **MUST REPRESENT THE SAME QUANTITY**
- unit extension must be used on all conversion factors except for very simple ones

Because the numerator and denominator represent the same, quantity, multiplication by a conversion factor is similar to multiplication by one. In this way, a conversion factor does not change a quantity, it merely changes the units for the quantity. When in doubt convert to moles!!!