RELATIVE MOLECULAR MASS-RELATIVE FORMULA MASS

Note : Room temperature and pressure is sometimes written as r.t.p. or RTP.

r.t.p means a temperature around 25^0C(298K) and 1 atmosphere pressure

AND the gas volume at r.t.p. is $25dm^3$.

3. Relative molecular mass (M_r)/Relative formula mass (M_r)

Units: no units

It is the mass of atoms on a scale where the mass of carbon is exactly 12 units.

Note: One must know to calculate M_r as it is required in 90% of the sums one comes across in stoichiometry.

(ii) Another fullerene has a relative molecular mass of 840.
How many carbon atoms are there in one molecule of this fullerene?

..... [1]

Solution:

Mass of one carbon atom= 12g

Hence mass of x carbon atoms is 840g

12x=840

x=840 ÷ 12 = 70

Hence There are 70 carbon atoms in 1 molecule of fullerene.

Example 2: **[O/N/06-P3-Q3b]**

(i) Calculate the relative formula mass of:

$CaCO_3$ .....

CaO ..... [2]

M_r ($CaCO_3$)= Ar (Ca) + Ar (C) + 3Ar(O)

= 40 + 12 + 3(16) = 40+12+48=100

Note : The answer does not have units written

Note: The word relative molecular mass is used for covalent compounds and the word relative formula mass is used for ionic compounds. But both are calculated in the same way.

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4. Calculating the mass/number of moles and M_r using the formula:

Mass = No. of moles x M_r

Unit: Mass-g ; M_r- no units ; No. of moles-no units

Example: **[O/N/06-P3-Q3-b(ii)]**

(b) When calcium carbonate is heated strongly, it decomposes.

$$CaCO_3 \rightarrow CaO + CO_2$$

(ii) 7.00 kg of calcium oxide was formed. What mass of calcium carbonate was heated?

.....

..... [2]

Mass= no of moles x M_r

Ideal mole ratio: $CaCO_3$: CaO : CO_2

1 : 1 : 1

Note: For every sum, writing down the ideal mole ratio is essential

Given:

Mass of CaO=7kg

Mr of CaO= 40+16= 56

No of moles of CaO= Mass ÷ M_r = 7 ÷ 56 = 0.125

Since;

Ideal mole ratio: $CaCO_3$: CaO : CO

1 : 1 : 1

Hence 0.125 : 0.125 : 0.125

Mass of $CaCO_3$ that was heated(used)= no of moles of $CaCO_3$ x M_r of $CaCO_3$

= 0.125 x 100

= 12.5kg
