

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°C (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

$$12x=840$$

$$x=840 \div 12 = 70$$

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]

$$\begin{aligned} M_r (\text{CaCO}_3) &= A_r (\text{Ca}) + A_r (\text{C}) + 3A_r (\text{O}) \\ &= 40 + 12 + 3(16) = 40+12+48=100 \end{aligned}$$

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.

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

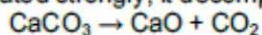
$$\text{Mass} = \text{No. of moles} \times M_r$$

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.



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

.....
..... [2]

$$\text{Mass} = \text{no of moles} \times M_r$$

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

M_r of CaO = 40+16= 56

No of moles of CaO = $\text{Mass} \div M_r = 7 \div 56 = 0.125$

Since;

Ideal mole ratio: CaCO_3 : CaO : CO_2

1 : 1 : 1

Hence 0.125 : 0.125 : 0.125

$$\begin{aligned} \text{Mass of CaCO}_3 \text{ that was heated(used)} &= \text{no of moles of CaCO}_3 \times M_r \text{ of CaCO}_3 \\ &= 0.125 \times 100 \\ &= 12.5\text{kg} \end{aligned}$$
