

3 The mole – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
mole	_____	_____	_____
relative atomic mass	_____	_____	_____
relative molecular mass	_____	_____	_____
particles	_____	_____	_____
Avogadro constant	_____	_____	_____
molar mass	_____	_____	_____

Recall

From Part 1 you can write a balanced equation. Now we count the **amounts**: how much reacts and how much is made, using the **mole** .

- Atoms are far too light to weigh one at a time.
- The mole lets us count particles by weighing.

Nothing here is hard – it just needs one equation.

New ideas

Read these first, then do the Practice.

■ 1 Relative masses

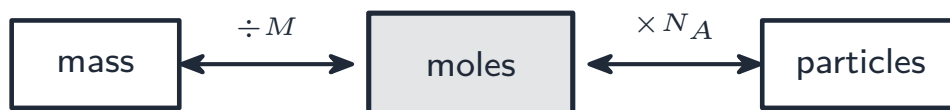
- the **relative atomic mass** (A_r) is the average mass of an element's atoms.
- the **relative molecular mass** (M_r) is the sum of the A_r values in a molecule.

$$M_r(\text{H}_2\text{O}) = (2 \times 1) + 16 = 18$$

■ 2 The mole

One **mole** contains 6.02×10^{23} **particles** (the **Avogadro constant**). The **molar mass** (in g/mol) has the same number as A_r or M_r . The key equation:

$$\text{amount (mol)} = \frac{\text{mass (g)}}{\text{molar mass (g/mol)}}$$



Worked example. Moles in 36 g of water ($M_r = 18$): $n = 36/18 = 2$ mol.

■ 3 Reacting masses

A balanced equation gives the **ratio** of the amounts. To find a reacting mass: mass $\rightarrow$ moles $\rightarrow$ (use the ratio) $\rightarrow$ moles $\rightarrow$ mass.



Watch out: apply the equation ratio to **moles**, not to masses – always convert mass $\rightarrow$ moles **first**. The molar mass (g/mol) has the same number as A_r or M_r .

Practice

Try these in order. Use A_r : H = 1, C = 12, O = 16, Na = 23.

3.1 Calculate the relative molecular mass, M_r , of (a) CO_2 , (b) H_2O . [2]

3.2 State the value of the Avogadro constant. [1]

3.3 How many moles are in 46 g of sodium ($A_r = 23$)? [2]

3.4 How many moles are in 88 g of CO_2 ($M_r = 44$)? [2]

3.5 How many particles are in 2 mol of a substance? [1]

3.6 Challenge. Magnesium burns: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$. What mass of magnesium oxide forms from 48 g of magnesium? (A_r : Mg = 24, O = 16.) [3]