Exercise walk-through

Relative masses of atoms and molecules ▪ 3.2

eXercise

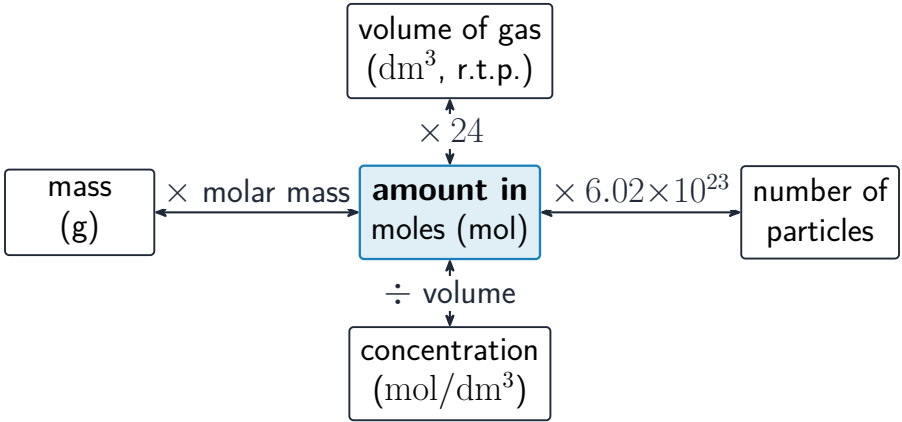
You must be able to

- state what A_r and M_r mean
- calculate M_r from a formula
- find a reacting mass by simple proportion

Method — Calculating M_r

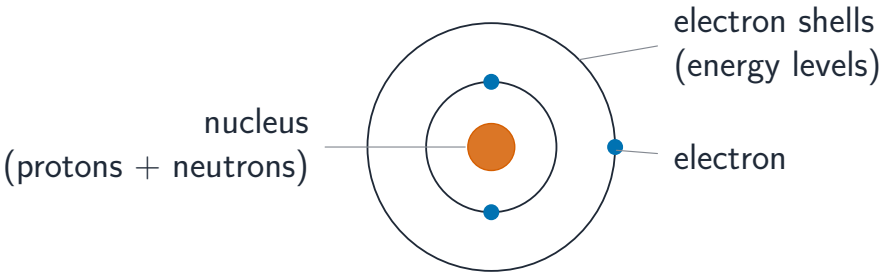
$M_r(\mathbf{H_2O}) = (2 \times 1) + 16 = 18$**.**
Proportion: if 24 g of Mg makes 40 g of MgO, then 12 g of Mg makes 20 g of MgO.

Method — Calculating M_r



A mole map linking mass, moles, gas volume and concentration

Method — Calculating M_r



lithium, Li: 3 protons, 4 neutrons
electron configuration 2,1

Relative mass comes from the protons and neutrons in the nucleus

Practice 2.1 ▪ 2 marks

Calculate the M_r of carbon dioxide, CO_2 (A_r: C $= 12$, O $= 16$).

Solution 2.1

Worked steps

$M_r = 12 + (2 \times 16) = 44$ M1 A1.

Practice 2.2 ▪ 1 mark

State what relative atomic mass means.

Solution 2.2

Method: Calculating M_r

Worked steps

the average mass of an atom of the element compared with $\frac{1}{12}$ the mass of a carbon-12 atom B1.

Exam-style 3.1 ▪ 1 mark

The relative formula mass of $CaCO_3$ (A_r: Ca $= 40$, C $= 12$, O $= 16$) is:

A 68

B 82

C 100

D 116

Solution 3.1

Method: Calculating M_r

A 68

B 82

C 100 ✓

D 116

Worked steps

C. $40 + 12 + (3 \times 16) = 100$.

Exam-style 3.2 ▪ 2 marks

Calculate the M_r of ammonium nitrate, NH_4NO_3 (A_r: N $= 14$, H $= 1$, O $= 16$).

Solution 3.2

Worked steps

$(2 \times 14) + (4 \times 1) + (3 \times 16) = 28 + 4 + 48 = 80$ M1 A1.

Exam-style 3.3 ▪ 2 marks

48 g of magnesium reacts completely with oxygen to form 80 g of magnesium oxide.
(a) Find the mass of magnesium oxide formed from 12 g of magnesium.
(b) Find the mass of oxygen that reacted with the 48 g of magnesium.

Solution 3.3

Method: Calculating M_r

Worked steps

(a) 12 g is a quarter of 48 g, so mass of MgO $= \frac{1}{4} \times 80 = 20$ g M1 A1.
(b) oxygen $= 80 - 48 = 32$ g B1.