

Chemical Calculations

The table on the right shows some relative atomic masses, A_r .

Use these values to answer the questions on this sheet.

Make sure you show all your working out.

Element	A_r
Al	27
Cl	35.5
Fe	56
H	1
Mg	24
N	14
O	16
S	32

Relative formula mass

The relative formula mass, M_r , of magnesium hydroxide is worked out like this:

$$M_r \text{ of } \text{Mg}(\text{OH})_2 = 24 + 2(16+1) = 24 + 34 = \underline{58}$$

Work out the M_r of the following compounds:

1. Iron(II) sulphide, FeS
2. Ammonium chloride, NH_4Cl
3. Magnesium sulphate, MgSO_4
4. Aluminium sulphate, $\text{Al}_2(\text{SO}_4)_3$

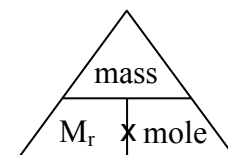
Masses and moles

Remember that one mole is the A_r or M_r of a substance in grams.

$$\text{mass} = A_r \times \text{number of moles}$$

and

$$\text{mass} = M_r \times \text{number of moles}$$



For example, the mass of 0.5 mol of magnesium hydroxide = $58 \times 0.5 = \underline{29 \text{ g}}$

Work out the mass of the following amounts (Hint – in questions 6, 7 and 8 work out the M_r first):

5. 1 mol of iron, Fe
6. 0.25 mol oxygen gas, O_2
7. 2 mol of water, H_2O
8. 0.1 mol of sulphur dioxide, SO_2

Work out the amount (number of moles) of water in the following cases:

9. 18 g of water
10. 9 g of water
11. 36 g of water
12. Which contains more atoms, 24 g of magnesium or 24 g of iron?

Concentration of solutions

The concentration of an aqueous solution is usually expressed in moles per cubic decimetre, mol dm^{-3} .

$$\text{concentration} = \frac{\text{number of moles}}{\text{volume}}$$

Work out the concentration of each of these solutions:

13. 1 mol of NaOH dissolved in 1 dm^3 of water
14. 0.5 mol of NaOH dissolved in 0.5 dm^3 water
15. 1 mol of NaOH dissolved in 2 dm^3 water
16. 1 mol of NaOH dissolved in 0.25 dm^3 water
17. $1 \text{ dm}^3 = 1000 \text{ cm}^3$, so $25 \text{ cm}^3 = 25/1000 = 0.025 \text{ dm}^3$.

What is the concentration (in mol dm^{-3}) of 0.25 mol of NaOH dissolved in 250 cm^3 water?