



- 1 In what molar ratio do the following substances react?
- a hydrochloric acid with calcium hydroxide **2 : 1** (1)
- b nitric acid with ammonia **1 : 1** (1)

2 Write an ionic equation, including state symbols, for each of the following reactions.

- a precipitation of silver(I) chloride when aqueous silver(I) nitrate is mixed with aqueous sodium chloride



- b reaction of aqueous potassium carbonate with sulfuric acid



- 3 What mass of aluminium reacts with 258 mg of chlorine? $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$

$$\text{mol Cl}_2 = \frac{0.258}{71.0} = 0.003634$$

$$\text{mol Al} = \frac{2}{3} \times 0.003634 = 0.002423$$

$$\text{mass Al} = 0.002423 \times 27.0 = 0.0654 \text{ g (3sf)} \quad (3)$$

- 4 Find the mass of one mole of ${}^7_3\text{Li}$ atoms given the following data.

$$\text{mass of proton} = 1.6726 \times 10^{-24} \text{ g}$$

$$\text{mass of electron} = 9.1094 \times 10^{-28} \text{ g}$$

$$\text{mass of neutron} = 1.6749 \times 10^{-24} \text{ g}$$

$$\text{Avogadro constant} = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$\text{mass of one atom} = 3(1.6726 \times 10^{-24}) + 4(1.6749 \times 10^{-24}) + 3(9.1094 \times 10^{-28}) = 1.1720 \times 10^{-23}$$

$$\text{mass of one mole of atoms} = 1.172 \times 10^{-23} \times 6.022 \times 10^{23} = 7.058 \text{ g (4sf)}$$