

## Activity 3B: Mole calculations

Ans p. 4

1. For the compound methane,  $\text{CH}_4$ , find the:
  - a. molar mass
  - b. mass of two moles
  - c. amount (number of moles) of methane in 64.0 g.
2. For a sample of ammonium sulfate,  $(\text{NH}_4)_2\text{SO}_4$ , with a mass of 1 320 g, calculate the:
  - a. molar mass of the ammonium sulfate
  - b. amount of ammonium sulfate
  - c. amount of ammonium ions
  - d. amount of sulfate ions
  - e. amount of sulfur atoms
  - f. amount of nitrogen atoms.
3. Calculate the mass of the following substances:
  - a. 10.7 mol of  $\text{C}_4\text{H}_{10}$        $M(\text{C}_4\text{H}_{10}) = 58.0 \text{ g mol}^{-1}$
  - b. 0.50 mol of  $\text{CCl}_4$
  - c. 0.250 mol of  $\text{CuO}$
4. Calculate the number of moles of each of the following samples:
  - a. 10.9 g of  $\text{CF}_2\text{Cl}_2$        $M(\text{CF}_2\text{Cl}_2) = 121 \text{ g mol}^{-1}$
  - b. 21.5 g of  $\text{Na}_2\text{CO}_3$        $M(\text{Na}_2\text{CO}_3) = 106 \text{ g mol}^{-1}$
  - c. 282 g of  $\text{ZnCO}_3$
  - d. 34 g of  $(\text{NH}_4)_2\text{CO}_3$

**Activity 3B: Mole calculations** (page 3)

1. a.  $M(\text{CH}_4) = M(\text{C}) + 4M(\text{H})$

$$= 12.0 + 4 \times 1.0 = 16.0 \text{ g mol}^{-1}$$

b.  $m = n \times M = 2 \times 16.0 = 32.0 \text{ g}$

c.  $n = \frac{m}{M} = \frac{64.0 \text{ g}}{16.0 \text{ g mol}^{-1}} = 4.00 \text{ mol}$

2. a.  $M((\text{NH}_4)_2\text{SO}_4) = 132.1 \text{ g mol}^{-1}$

b.  $n((\text{NH}_4)_2\text{SO}_4) = \frac{1320 \text{ g}}{132.1 \text{ g mol}^{-1}} = 10.0 \text{ mol}$

c.  $n(\text{NH}_4^+) = 2 \times n((\text{NH}_4)_2\text{SO}_4) = 2 \times 10.0 = 20.0 \text{ mol}$

d.  $n(\text{SO}_4^{2-}) = n((\text{NH}_4)_2\text{SO}_4) = 10.0 \text{ mol}$

e.  $n(\text{S}) = n(\text{SO}_4^{2-}) = 10.0 \text{ mol}$

f.  $n(\text{N}) = n(\text{NH}_4^+) = 20.0 \text{ mol}$

3.  $m = n \times M$

a.  $m = 10.7 \text{ mol} \times 58.0 \text{ g mol}^{-1} = 620.6 \text{ g}$

b.  $M(\text{CCl}_4) = 154 \text{ g mol}^{-1}$

$$m = 0.50 \text{ mol} \times 154 \text{ g mol}^{-1} = 77 \text{ g}$$

c.  $M(\text{CuO}) = 79.6 \text{ g mol}^{-1}$

$$m = 0.250 \text{ mol} \times 79.6 \text{ g mol}^{-1} = 19.9 \text{ g}$$

4.  $n = \frac{m}{M}$

a.  $n = \frac{10.9 \text{ g}}{121 \text{ g mol}^{-1}} = 0.0901 \text{ mol}$

b.  $n = \frac{21.5 \text{ g}}{106 \text{ g mol}^{-1}} = 0.203 \text{ mol}$

c.  $n = \frac{10.0 \text{ g}}{159.7 \text{ g mol}^{-1}} = 0.0626 \text{ mol}$

d.  $M((\text{NH}_4)_2\text{CO}_3) = 96.0 \text{ g mol}^{-1}$

$$n = \frac{34 \text{ g}}{96.0 \text{ g mol}^{-1}} = 0.35 \text{ mol}$$