

Solutions

Each answer shows the steps, then the **result**.

2.1

- mass percent is the element's mass over the molar mass:

$$\% \text{O} = \frac{16}{18} \times 100\%$$

- $\% \text{O} = \mathbf{89\%}$

2.2

- The simplest whole-number ratio of atoms

2.3

- molar mass is a whole multiple of the empirical mass:

$$n = \frac{M}{M_{\text{emp}}} = \frac{90}{30}$$

- $n = \mathbf{3}$

2.4

- 2 : 3 (multiply both by 2)

3.1 B

- the simplest whole-number ratio of atoms

3.2 C

- C: $75/12 = 6.25$, H: $25/1 = 25$; ratio 1 : 4, so CH_4

3.3

(a)

- take 100 g, so the percents become grams, and convert to moles:

$$n(\text{S}) = \frac{40 \text{ g}}{32 \text{ g mol}^{-1}} = 1.25 \text{ mol}, \quad n(\text{O}) = \frac{60 \text{ g}}{16 \text{ g mol}^{-1}} = 3.75 \text{ mol}$$

- divide by the smaller, 1.25: S = 1, O = 3
- empirical formula **SO₃**

(b)

- Convert mass percents to moles and divide by the smallest

3.4

(a)

- $n = 56/14 = 4$

(b)

- C_4H_8