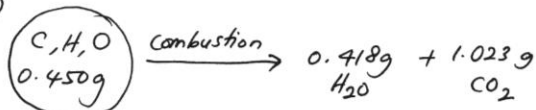


Sem 2 (2008/09) - Stoichiometry

4(c)



Given  $M_r$  (caproic acid) = 116.2 amu

$$\text{CO}_2 \rightarrow \text{C} \quad n_{\text{C}} = n_{\text{CO}_2} = \left(\frac{1.023}{44}\right) = 0.02325 \text{ mol}$$

$$m_{\text{C}} = (0.02325 \times 12) = 0.279 \text{ g}$$

$$\text{H}_2\text{O} \rightarrow 2\text{H} \quad \frac{n_{\text{H}}}{n_{\text{H}_2\text{O}}} = \frac{2}{1} \quad \therefore n_{\text{H}} = 2 \times n_{\text{H}_2\text{O}} = 2 \times \frac{0.418}{18}$$

$$\therefore n_{\text{H}} = 0.046 \text{ mol}$$

$$\therefore m_{\text{H}} = 0.046 \text{ g}$$

$$m_{\text{O}} = 0.450 - m_{\text{C}} - m_{\text{H}}$$

$$= (0.450 - 0.279 - 0.046) \text{ g}$$

$$= 0.125 \text{ g}$$

$$n_{\text{O}} = \frac{0.125}{16} = 7.813 \times 10^{-3} \text{ mol}$$

$$n_{\text{C}} : n_{\text{H}} : n_{\text{O}} = 0.02325 : 0.046 : 7.813 \times 10^{-3}$$

$$= \frac{0.02325}{7.813 \times 10^{-3}} : \frac{0.046}{7.813 \times 10^{-3}} : 1$$

$$= 3 : 6 : 1$$

The empirical formula =  $\text{C}_3\text{H}_6\text{O}$  (Ans) //

$$(\text{C}_3\text{H}_6\text{O})_n = 116.2$$

$$(36 + 6 + 16)n = 116.2$$

$$58n = 116.2$$

$$n = 2$$

The molecular formula =  $\text{C}_6\text{H}_{12}\text{O}_2$  (Ans) //

