

A.43. La composició centesimal d'un compost és 20,24 % d'alumini i 79,76 de clor. Una massa de 2,67 g de vapor d'aquest compost ocupa un volum de 380 mL a 1 atm i 465 K. Calculeu la fórmula empírica i molecular. $\text{Al}=26,98$ $\text{Cl}=35,45$

$$m_{\text{compost}} = 100 \text{ g} \rightarrow \begin{array}{ll} m_{\text{Al}} = 20,24 \text{ g} & M_{\text{Al}} = 26,98 \text{ g/mol} \\ m_{\text{Cl}} = 79,76 \text{ g} & M_{\text{Cl}} = 35,45 \text{ g/mol} \end{array}$$

$$m_{\text{compost}} = 100 \text{ g} \rightarrow \begin{array}{l} n_{\text{Al}} = \frac{m_{\text{Al}}}{M_{\text{Al}}} = \frac{20,24}{27} = 0,75 \text{ mol} \\ n_{\text{Cl}} = \frac{m_{\text{Cl}}}{M_{\text{Cl}}} = \frac{79,76}{35,45} = 2,25 \text{ mol} \end{array} \quad \frac{n_{\text{Cl}}}{n_{\text{Al}}} = 3 \quad \text{La fórmula empírica és } \text{AlCl}_3$$

Per determinar la fórmula molecular necessita la massa molecular M

$$\begin{array}{ll} m = 2,67 \text{ g} & n = \frac{m}{M} \\ V = 380 \text{ mL} = 0,38 \text{ L} & P \cdot V = n \cdot R \cdot T \\ P = 1 \text{ atm} & P \cdot V = \frac{m}{M} R \cdot T \\ T = 465 \text{ K} & M = \frac{m \cdot R \cdot T}{P \cdot V} \\ R = 0,082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} & M = \frac{2,67 \times 0,082 \times 465}{1 \times 0,38} = 267,91 \text{ g/mol} \end{array}$$

La fórmula molecular serà $(\text{AlCl}_3)_a$

$$M_r[(\text{AlCl}_3)_a] = 267,91$$

$$a = \frac{267,91}{133,33} = 2$$

$$M_r[\text{AlCl}_3] = 133,33$$

La fórmula molecular serà Al_2Cl_6