

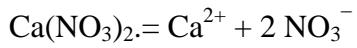
### Problem 13-29 Osmotic pressure of electrolyte solutions

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What is the value of osmotic pressure of  $598.4 \text{ cm}^3$  of aqueous solution containing  $0.88 \text{ g Ca(NO}_3)_2$ ? Calcium nitrate ( $M = 164 \text{ g mol}^{-1}$ ) is a strong electrolyte, in aqueous solution completely dissociated. Assume that van't Hoff equation can be applied.

$$[\pi = 71.167 \text{ kPa}]$$

Solution:



Complete dissociation:  $i = 3$

$$\pi = i \cdot c_2 \cdot RT$$

$$c_2 = \frac{n_2}{V} = \frac{m_2}{M_2 \cdot V}$$

$$m_2 = 0.88 \text{ g}$$

$$V = 598.4 \text{ cm}^3 = 5.984 \cdot 10^{-4} \text{ m}^3$$

$$T = 318.2 \text{ K}$$

$$M = 164 \text{ g mol}^{-1}$$

$$\pi = i \cdot \frac{m_2}{M_2 \cdot V} \cdot RT = 3 \cdot \frac{0.88}{164 \cdot 5.984 \cdot 10^{-4}} \cdot 8.314 \cdot 318.2 = 71167 \text{ Pa}$$

$$\left[ \frac{\text{g} \cdot (\text{N m K}^{-1} \text{ mol}^{-1}) \cdot \text{K}}{(\text{g mol}^{-1}) \cdot \text{m}^3} = \text{N m}^{-2} \right]$$