

Answer on Question #75167, Chemistry / General Chemistry

What is the molality of a solution in which 150 g of Magnesium Nitrate, $\text{Mg}(\text{NO}_3)_2$, are dissolved in 400.0 g of warm water?

- A. 0.5 m
- B. 0.5 M
- C. 2.53 m
- D. 2.53 M
- E. None of the Above

Solution:

Right answer is - C. 2.53 m

First, we need to determine the molar mass of $\text{Mg}(\text{NO}_3)_2$ and it is:

$$M(\text{Mg}(\text{NO}_3)_2) = 24 + 14 \times 2 + 16 \times 3 \times 2 = 24 + 28 + 96 = 148 \text{ g/mol}$$

Based on the condition we have 150g $\text{Mg}(\text{NO}_3)_2$; Knowing the molar mass, we calculate the amount of substance that we have:

$$\frac{150 \text{ g}}{148 \text{ g/mol}} \approx 1,01 \text{ mol}$$

Based on the definition of the concept of molality - the amount of dissolved substance (number of moles) per 1000 g of solvent, we have a formula for determining this quantity:

$$m = \frac{\nu}{m_2}$$

where: m – molality, ν - amount of solute (mol number), m_2 - mass of solvent, kg.

it follows, that:

$$m = \frac{1,01}{0,4} \approx 2,53 (\text{mol/kg}) \text{ or } 2,53 \text{ m}$$

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