Answer on Question #73224, Chemistry / General Chemistry :

A solution prepared by dissolving 88.2 mg of a nonelectrolyte in water and diluting to a volume of 10.0 mL gives an osmotic pressure of 67.3 mmHg at 300. K. What is the molecular weight of the nonelectrolyte in g/mol? Correct number of sig figs.

Solution.

$V = 10.0 ml = 0.01 l$

$m = 88.2 mg = 88.2 \cdot 10^{-3} g$

$p = 67.3 mmHg$

$T = 300 K$

$M - ?$

Equation for osmotic pressure:

$p = c \cdot R \cdot T$

And:

$p = \dfrac{m}{M \cdot V} \cdot R \cdot T$

$M = \dfrac{m}{p \cdot V} \cdot R \cdot T$

The molecular weight of the nonelectrolyte:

$M = \dfrac{88.2 \cdot 10^{-3}}{67.3 \cdot 133.32 \cdot 0.01} \cdot 8.314 \cdot 300$

$M = 2.45 g / mol$

Answer: $M = 2.45 g / mol$.

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