Molality ($\bar{m}$) - Example of Work

How many g H_2O (solvent) do I need to add to 25.7 g KNO_3 to make a 0.840 $\bar{m}$ KNO_3 solution?

By Equ: $\bar{m} = \frac{\text{mole solute}}{\text{kg solvent}} \Rightarrow \text{kg solvent} = \frac{\text{mole solute}}{\bar{m}}$

a. Need mole KNO_3

mm KNO_3: $1(39g) + 1(14g) + 3(16g) = 101\ g\ KNO_3$

$\frac{101\ g\ KNO_3}{1\ mole\ KNO_3}$

$(25.7\ g\ KNO_3)\left(\frac{1\ mole\ KNO_3}{101\ g\ KNO_3}\right) = 0.2544\ mole\ KNO_3$

b. plug info into Equ

$0.840\ \bar{m} = \frac{0.840\ mole\ KNO_3}{1\ kg\ H_2O}$

$kg\ H_2O = \frac{0.2544\ mole\ KNO_3}{\left(\frac{0.840\ mole\ KNO_3}{1\ kg\ H_2O}\right)}$

$= 0.3028\ kg\ H_2O\left(\frac{1000\ g\ H_2O}{1\ kg\ H_2O}\right)$

$= 302.8\ g\ H_2O = \boxed{303\ g\ H_2O}$

By DA

mm KNO_3: $1(39g) + 1(14g) + 3(16g) = \frac{101\ g\ KNO_3}{1\ mole\ KNO_3}$

$0.840\ \bar{m} = \frac{0.840\ mole\ KNO_3}{1\ kg\ H_2O}$

$25.7\ g\ KNO_3$

$(25.7\ g\ KNO_3)\left(\frac{1\ mole\ KNO_3}{101\ g\ KNO_3}\right)\left(\frac{1\ kg\ H_2O}{0.840\ mole\ KNO_3}\right)\left(\frac{1000\ g\ H_2O}{1\ kg\ H_2O}\right) = 302.9\ g\ H_2O$

$= \boxed{303\ g\ H_2O}$