Question #51039, Chemistry, Physical Chemistry

On addition of a solute, the vapor pressure of a liquid reduced to 9/10th of its original value. If 2 gram of solute (molar mass = 100) is added to 100 grams of the liquid to achieve that reduction then find the molar mass of the solvent assume ideality.

Answer:

M_{solute} = 100

m_{solute}= 2 g

$m_{solvent}$= 100 g

P^0=1

P=0.9

$M_{solvent}$ - ?

Raoult's law

$$\frac{(P_A^o - P_A)}{P_A^o} = X_B$$

$$X_j = \frac{\nu_j}{\sum_{i=1}^{n} \nu_i}$$

$(P^0-P)/P^0 = 0.1$

$X=0.1$

n_{solute}=2 g / 100 g/mol = 0.02 mol

$n_{solvent}$= $(n_{solute}-X*n_{solute})/X$

$n_{solvent}$=(0.02-0.1*0.02)/0.1=0.18

$M_{solvent}$=m/$n_{solvent}$=100/0.18 = 555.5