(c) Suppose that during the experiment a significant but unknown amount of solvent evaporates from the test tube. What effect would this have on the calculated value of the molar mass of the solid (i.e., too large, too small, or no effect)? Justify your answer.

(d) Show the setup for the calculation of the percentage error in a student's result if the student obtains a value of 126 g mol^{-1} for the molar mass of the solid when the actual value is 120. g mol^{-1}.

(b) i. You must measure the mass of the unknown solid first. Then, you record the temperature depression and the weight in kg of the solvent. This, with the known K_f, will allow you to fill in the variables in the equation $\Delta T = i k_f \left(\frac{\text{moles solute}}{\text{kg solvent}} \right)$. This will give you moles solute, and then you divide the mass of solute by the moles solute.

ii. $\Delta T = i k_f \times \text{molality}$

$\Delta T = i k_f \times \left(\frac{\text{moles solute}}{\text{kg solvent}} \right)$

$\text{moles solute} = \frac{(\Delta T)(\text{kg solvent})}{(i k_f)}$

$\frac{\text{mass solute}}{\text{moles solute}} = \text{molar mass}$

iii. The difference in temperatures provides the ΔT so that there is only one unknown in the freezing-point depression equation.

(c) The evaporation of solvent decreases the mass of solvent that was originally recorded. Therefore, with less solvent, less solute will form and this then increases the molar mass because the molality is incorrect, causing the moles collected to decrease, and when the denominator decreases, the molar mass increases.

(d) $\frac{\text{experimental} - \text{actual}}{\text{actual}} \times 100\% = \% \text{ error}$

$\frac{126 \text{ g mol}^{-1} - 120 \text{ g mol}^{-1}}{120 \text{ g mol}^{-1}} = \% \text{ error}$