Answer on Question#39279 - Chemistry - Other

Question

66. Determine the mass of a nonvolatile, nonionizing compound that must be added to 3.81 kg of water to lower the freezing point to 98.70°C. The molar mass of the compound is 50.0 g/mol and the Kf for water is 1.86°C kg/mol.

> A.> 202 g
> B.> 133 g
> C.> 461 g
> D.> 9.17 g
> E.> 18.8 g

Answer

Obviously, the author meant that the freezing point of water is 100 °C. This is not true, but in case of test we should choose the correct option, so must use the data even if it is incorrect. The freezing point drop ΔT is a colligative property of the solution, and for dilute solutions is found to be proportional to the molal concentration cm of the solution:

ΔT = i·μ·K$_f$

where μ is the molality of the solution, I is a van 't Hoff factor. For nonionizing compounds i = 1.

$$\mu = n(solute)/m(solvent) = \frac{m(solute)}{M(solute) \cdot m(solvent)}$$

ΔT = 100-98.7=1.3

The formula for the mass of solute is:

$$m(solute) = \frac{\Delta T \cdot M(solute) \cdot m(solvent)}{i \cdot K_f} = 133$$

So, the correct answer is B.