

TOPIC

Chemistry – Section III – Question 5

QUESTION

The boiling point elevation constant for water is $K_{bp} = 0.52^{\circ}\text{C/molal}$. If the normal boiling point of water is 100°C , the normal boiling point (in $^{\circ}\text{C}$) of water containing 1 % by weight NaCl (assume NaCl is completely dissociated) most nearly is

- (A) 100.09
- (B) 100.18
- (C) 105.20
- (D) 110.40

HINT

Molality of the ions will be twice the molality of the salt if it is completely dissociated.

SOLUTION

Basis: 100 grams of solution.

Thus there are 99 gr or 0.099 kg of water.

There is also 1 gr of salt, so moles of salt = $1 \text{ gr}/(58.5 \text{ gr/mol}) = 0.017$ moles.

Thus there are $2 \times 0.017 = 0.034$ moles of ions.

The molality of ions is $0.034 \text{ moles}/0.099 \text{ kg of solvent} = 0.345 \text{ molal}$.

The boiling point elevation is therefore

$$0.52^{\circ}\text{C/molal} \times 0.345 \text{ molal} = 0.18^{\circ}\text{C}$$

and the new boiling point is 100.18°C .

ANSWER

(B)

CONTRIBUTOR

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