

NCERT/CBSE PHYSICS CLASS 11 textbook

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Solutions/Answers to NCERT/CBSE CHEMISTRY Class 12 (Class XII) textbook

Exercise CHAPTER TWO

SOLUTIONS

EXERCISES

2.32

Calculate the depression in the freezing point of water when 10 g of $\text{CH}_3\text{CH}_2\text{CHClCOOH}$ is added to 250 g of water. $K_a = 1.4 \times 10^{-3}$, $K_f = 1.86$ K kg mol⁻¹.

Scroll down for answer

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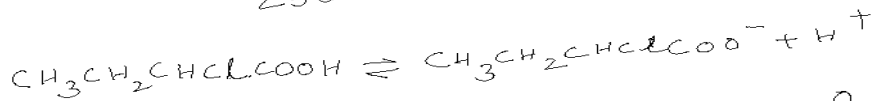
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$$\text{Molar Mass of } \text{CH}_3\text{CH}_2\text{CHClCOOH} = 122.5$$

$$10 \text{ gms of } \text{CH}_3\text{CH}_2\text{CHClCOOH} = \frac{10}{122.5} = 8.16 \times 10^{-2} \text{ mole}$$

$$\text{Molality} = \frac{8.16 \times 10^{-2}}{250} \times 1000 = 0.3264$$



Initial	C mol L ⁻¹	0	0
At Eqm	C(1-α)	Cα	Cα

α is the degree of dissociation

$$K_a = \frac{[\text{CH}_3\text{CH}_2\text{CHClCOO}^-][\text{H}^+]}{[\text{CH}_3\text{CH}_2\text{CHClCOOH}]}$$

$$= \frac{C\alpha \cdot C\alpha}{C(1-\alpha)} = C\alpha^2$$

$$K_a = C\alpha^2, \quad \alpha = \sqrt{K_a/C}$$

$$= \sqrt{\frac{1.4 \times 10^{-3}}{0.3264}} = 0.065$$

Van't Hoff factor

$$i = \frac{1+\alpha}{1} = 1+\alpha$$

$$= 1+0.065 = 1.065$$

$$\begin{aligned} \Delta T_f &= i K_f m = 1.065 \times 1.86 \times 0.3264 \\ &= 0.65^\circ \end{aligned}$$