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~~23~~ 28

$\frac{5.1\ gm}{51}$

$$NH_4SH(s) \longrightarrow NH_3(g) + H_2S(g)$$

$0.1\ mol$

$\underline{0.1 \times 0.3}$ $\underline{0.1 \times 0.3}$

$$P = \frac{0.1 \times 0.3\ RT}{V}$$

$$K_p = P^2$$

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(a) backward

(b) No change

B

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$$K_c = K_p (RT)^{-1/2}$$

(C) $\underline{K_p = K_c (RT)^{-1/2}}$

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Ionic Eqlbm

This chapter mainly deals with

1) pH of solution
2) Solubility & Solubility product
3) Indicators

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Arrhenius theory of dissociation :→

It states that there exist a dynamic eq^lb^m betⁿ ionised and unionised solute.

$$BA(aq) \longrightarrow B^+(aq) + A^-(aq)$$

$$C - x \qquad x \qquad x$$

$$\boxed{C(1-\alpha)} \qquad (C\alpha) \qquad C\alpha$$

$$K_{diss} = K_C = \frac{[B^+][A^-]}{[BA]} = \frac{x^2}{C-x} = \frac{C\alpha^2}{1-\alpha}$$

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

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α depends on

1) Nature of solute

2) Nature of solvent :— As dielectric constant ↑es α ↑es

3) Temperature : Since dissociation is an endothermic process therefor as T ↑es α ↑es

4) Concentration

$$K_c = \frac{c\alpha^2}{1-\alpha}$$

Ostwald dilution law :→

As concentration ↓es α ↑es

$C\downarrow \ \alpha\uparrow$

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⑤ Common ion effect

$$BA(aq) \longrightarrow B^+(aq) + A^-(aq)$$
$$c-x \qquad x \qquad x$$

$$BA(aq) \longrightarrow B^+(aq) + A^-(aq)$$
$$c-y \qquad \underline{b}+y \qquad y$$

(A) $x = y$

(B) $x > y$

(C) $x < y$

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Dissociation of H_2O

$$H_2O(l) \longrightarrow H^+(aq) + OH^-(aq)$$

$$K_{diss} = \frac{[H^+][OH^-]}{[H_2O]}$$

$$K_{diss}[H_2O] = [H^+][OH^-]$$

$$[H_2O] = \frac{1000}{18}$$

$$K_w = [H^+][OH^-]$$

ionic product of H_2O

At 25°C

$$K_w = 10^{-14}\,(mol/lit)^2$$

As $T \uparrow$ $K_w \uparrow$es

NH_3 (liq)

NH_2^- NH_4^+

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if $[H^+] > [OH^-]$ Acidic

$[H^+] < [OH^-]$ Basic

$[H^+] = [OH^-]$ Neutral

at 25°C

$[H^+] = 10^{-7}$	$[OH^-] = 10^{-7}$	Neutral
$[H^+] > 10^{-7}$	$[OH^-] < 10^{-7}$	Acidic
$[H^+] < 10^{-7}$	$[OH^-] > 10^{-7}$	Basic

$[H^+][OH^-] = 10^{-14}$

$pH = -\log[H^+]$ $pOH = -\log[OH^-]$

at 25°C

$[H^+] = 10^{-7}$	$pH = 7$	Neutral
$[H^+] > 10^{-7}$	$pH < 7$	Acidic
$[H^+] < 10^{-7}$	$pH > 7$	Basic

$[H^+][OH^-] = K_w$

$pH + pOH = pK_w$

at 25°C $pH + pOH = 14$

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Q. At $80^\circ C$, $K_W = 4 \times 10^{-12}\ M^2$ $\log 2 = 0.3$

find ① pH of pure H_2O

② Define a solution as acidic, basic or neutral having pH

(i) 5 Acidic

(ii) 6 Basic

(iii) 7 Basic

$[H^+][OH^-] = 4 \times 10^{-12}$

$[H^+]^2 = [OH^-]^2 = 4 \times 10^{-12}$

$[H^+] = 2 \times 10^{-6}$

$pH = 6 - \log 2 = 5.7$

chemical eqlbm

JEE-Adv

O-II

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$$N_2 + 3H_2 \longrightarrow 2NH_3$$

$$2NH_3 \longrightarrow N_2 + 3H_2$$

$\frac{1}{K_p}$

P_{NH_3} $\qquad P/4 \qquad 3P/4$

$$\frac{1}{K_p} = \frac{P/4 \times (3P/4)^3}{P_{NH_3}^2}$$

$$P_{NH_3}^2 = K_p \times P^4 \times \frac{27}{\cancel{2} 2^8}$$

$$P_{NH_3} = K_p^{1/2} \times P^2 \times \frac{3^{3/2}}{2^4}$$

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$$K = 11/6 = 2$$