DPP SOLUTION

- Subject – Physical Chemistry
- Chapter – Ionic Equilibrium

DPP No.- 02

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Question-

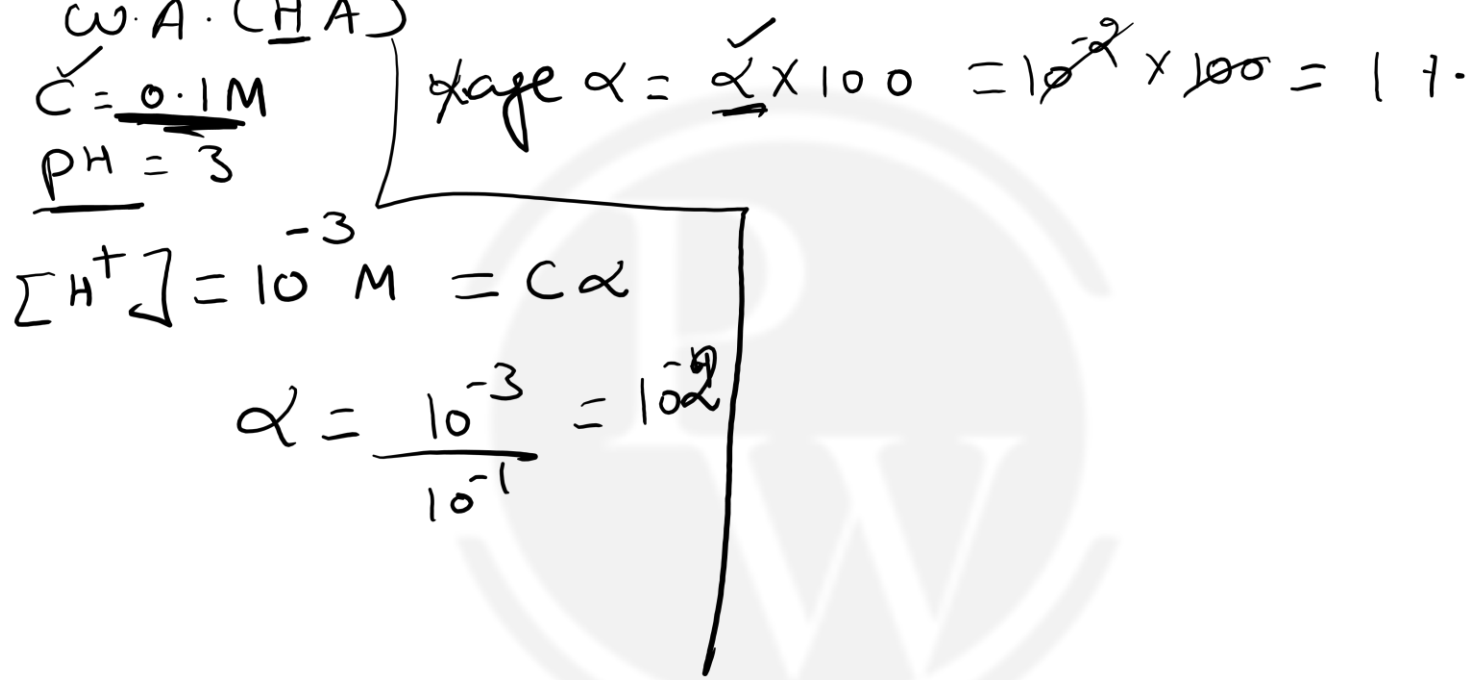
The pH of a 0.1 M aqueous solution of a weak acid (HA) is 3. What is its degree of dissociation?

(1) 1 %

(2) 10 %

(3) 50 %

(4) 25 %



Ans. (1)

Question-

What is the pH value of N/1000 KOH solution?

1. $\times 10^{-11}$
2. $\times 3$
3. $\times 2$
4. 11

pH = ? KOH $N = \frac{1}{1000} N \Rightarrow M = \frac{1}{1000} M$ → S.B.

$KOH + H_2O \rightarrow K^+ + OH^-$

$\frac{1}{1000}$ M $\frac{1}{1000} M = 10^{-3} M$

$[OH^-] = 10^{-3} M$

$pOH = -\log 10^{-3}$

$= 3 \log 10$

$= 3$

$pH = 14 - pOH$

$= 14 - 3 = 11$

Ans. (4)

Question-

The pH of a 10^{-9} M solution of HCl in water is :

1. 8 ✗
2. −8 ✗
3. Between 7 and 8 ✗
4. Between 6 and 7 ✓

H^+ or H_3O^+

acid $[H^+] < 10^{-6}$ M

$[H^+]$ from H_2O add

$[H^+]_{H_2O} = 10^{-7}$

pH = ?

$[HCl] = 10^{-9}$ M

$HCl + H_2O \rightleftharpoons H^+ + Cl^-$

10^{-9} $\quad\quad$ 10^{-9} $\quad$ 10^{-7}

$[H^+] = 10^{-7}\left(\frac{1}{100} + 1\right)$

$= 10^{-7}\left(\frac{1+100}{100}\right) = \frac{101}{100} \times 10^{-7}$

$= 101 \times 10^{-9}$

$pH = -\log 101 \times 10^{-9}$

$= 9 - \log 101 = 9 - 2.0043 = 6.9957$

Ans. (4)

Question-

dilute $[H^+] \downarrow$ pH $\uparrow$

An acid solution of pH = 6 is diluted hundred times. The pH the solution becomes:

1. 6.95
2. X 6
3. X 4
4. X 8

acid pH = 6 $V_1 = V$ L, $V_2 = 100V$ L

$[H^+] = 10^{-6}$ M $M_1 = 10^{-6}$ M, $M_2 = ?$

$$M_2 = \frac{M_1 V_1}{V_2} = \frac{10^{-6} \times V}{100V} = 10^{-8} \text{ M} = [H^+]$$

$$[H^+]_{Total} = 10^{-8} + 10^{-7}$$

$$= 10^{-7}\left(\frac{1}{10} + 1\right) = \frac{11}{10} \times 10^{-7} = 11 \times 10^{-8}$$

$$pH = -\log 11 \times 10^{-8}$$

$$= 8 - \log 11 = 8 - 1.0414 = 6.9586$$

Ans. (1)

Question-

The number of H^+ ions present in 1 mL of a solution having pH = 13 is :

1. 10^{13}
2. 6.023×10^{13}
3. 6.023×10^{7}
4. 6.023×10^{10}

no. of H^+ ions in 1ml solution

pH = 13 $[H^+] = 10^{-13}$ M

1000 ml solution H^+ moles $= 10^{-13}$

1 ml $= \frac{10^{-13}}{1000} = 10^{-16}$ moles H^+

no. of H^+ ions $= 10^{-16} \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{7}$

Ans. (3)

Question-

The pH of a solution is increased from 3 to 6 ; its H^+ ion concentration will be:

1. Reduced to half
2. Doubled
3. Reduced by 1000 times
4. Increased by 1000 times

pH inc. by 1 unit H^+ Conc. - dec. by 10 units

$3 \xrightarrow{10\downarrow} 4 \xrightarrow{10\downarrow} 5 \xrightarrow{10\downarrow} 6$

$pH_1 = 3$

$[H^+_1] = 10^{-3}\ M$

$M_1 = 10^{-3}\ M$

$V_1 = V\ L$

$pH_2 = 6$

$[H^+_2] = 10^{-6}\ M$

$M_2 = 10^{-6}\ M$

$V_2 = ?$

$M_1V_1 = M_2V_2$

$$V_2 = \frac{10^{-3} \times V}{10^{-6}} = 1000V$$

V 1000 times inc. $\Rightarrow$ Conc. $= \frac{n}{V_L}$

Conc $\longrightarrow$ dec

Ans. (3)

Question-

What is the pH of a 0.015 M $Ba(OH)_2$ solution?

1. ✗ 1.82
2. ✗ 1.52
3. 12.48
4. 12.18

$Ba(OH)_2 + H_2O \rightleftharpoons Ba^{2+} + 2OH^-$

$15 \times 10^{-3}\ M \qquad 2 \times 15 \times 10^{-3}\ M$

$= 30 \times 10^{-3}\ M$

$[OH^-] = 30 \times 10^{-3}$

$pOH = -\log [OH^-]$

$= -\log 30 \times 10^{-3}$

$= 3 - \log 30$

$= 3 - [\log 3 + \log 10]$

$pOH = 3 - [0.48 + 1]$

$= 3 - 1.48 = 1.52$

$pH = 14 - pOH$

$= 14 - 1.52$

$= 12.48$

Ans. (3)

Question-

The aqueous solution whose pH = 0 is

1. Acidic
2. Alkaline
3. Amphoteric
4. Neutral

pH → 0 to 7 → sol^n acidic
→ 7 to 14 → sol^n basic
= 7 → sol^n neutral

$pH = 0$

$[H^+] = 10^{-0} = \frac{1}{10^0} = \frac{1}{1} = 1M$

Ans. (1)

Question-

For an acid solution, the $[OH^-]$ is

$[H^+] > 10^{-7}$ M

10^{-6} M, 10^{-5}

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

$[OH^-] = \frac{K_w}{[H^+]} = \frac{10^{-14}}{10^{-5}} = 10^{-9}$

1. $> 10^{-7}$
2. $< 10^{-7}$
3. 10^{-14}
4. 10^{-7}

Ans. (2)

Question-

The pH of a solution is 6.0. In this solution

1. $[H^+] = 100\,[OH^-]$
2. $[H^+] = 10\,[OH^-]$
3. $[H^+] = [OH^-]$
4. $[H^+] = \frac{1}{10}\,[OH^-]$

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

$[OH^-] = \frac{K_w}{[H^+]} = \frac{10^{-14}}{10^{-6}} = 10^{-8}\ M$

$[H^+] = 100\,[OH^-]$

Ans. (1)

Question-

pH of an aqueous solution of NaCl at 85°C should be

aq. sol^{n} NaCl → salt of S.A. & S.B → pH neutral at any temp.

T ↑ pH scale dec. ∴ neutral pH ↓

1. 7
2. > 7
3. < 7
4. 0

Ans. (3)

Question-

Select the correct statement

1. If $[H^+] = y \times 10^{-x}$ then pH = x – log y
2. If $[H^+] = \frac{1}{y} \times 10^{-x}$ then pH = x + log y
3. pH of a solution = 14 + log $[OH^-]$
4. All of the above

$[H^+] = y \times 10^{-x}$

$pH = -\log [H^+] = -\log (y \times 10^{-x})$

$pH = -[\log y + \log 10^{-x}]$

$= -[\log y - x \log 10]$

$= x \log 10 - \log y$

$pH = x - \log y$

$[H^+] = \frac{1}{y} \times 10^{-x}$

$pH = -\left(\log \frac{1}{y} \times 10^{-x}\right) = -[\log 1 - \log y + \log 10^{-x}] = -[\log 1 - \log y - x \log 10]$

$= -[-\log y - x]$

$pH = x + \log y$

Ans. (4)

Question-

The $[H^+]$ of a solution is 0.03 M. The pOH of this solution is

1. 12.48
2. 12.52
3. 12.54
4. 12.58

$[H^+] = 3 \times 10^{-2}$ M

$pH = 2 - \log 3 = 2 - 0.48 = 1.52$

$pOH = 14 - pH = 14 - 1.52 = 12.48$

Ans. (1)

Question-

For a 100 ml solution of 10^{-2} M NaOH the ratio pH : pOH would be

1. 6 : 1
2. 1 : 6
3. 2 : 1
4. 10^{10} : 1

$[OH^-] = 10^{-2}$ M

pOH = 2

pH = 14 − pOH = 12

$\frac{pH}{pOH} = \frac{12}{2} = \frac{6}{1}$

Ans. (1)

Question-

10^{-2} mole of KOH is dissolved in 10 litres of water. The pH of the solution is

1. 12
2. 2
3. 3
4. 11

$M_{KOH} = \frac{10^{-2}}{10} = 10^{-3}$ M KOH $\Rightarrow$ $[OH^-] = 10^{-3}$ M

$pOH = -\log 10^{-3}$

$= 3$

$pH = 14 - pOH$

$pH = 14 - 3 = 11$

Ans. (4)

Thank You...