DPP SOLUTION

- Subject – Physical Chemistry
- Chapter – Ionic Equilibrium

DPP No.- 03

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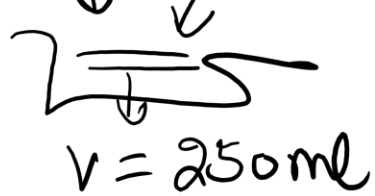
Question-

4.0 g of NaOH and 4.9 g of H_2SO_4 are dissolved in water and volume is made upto 250 ml. The pH of this solution is

1. 7
2. 1
3. 2
4. 12

SB 4g NaOH 4.9g H_2SO_4 S.A.



$E_{NaOH} = \frac{40}{1} = 40$

$E_{H_2SO_4} = \frac{98}{2} = 49$

g eq of $NaOH = \frac{4}{40} = 0.1$

$H_2SO_4 = \frac{4.9}{49} = 0.1$

Soln neutral as geq acid = geq base.

pH = 7

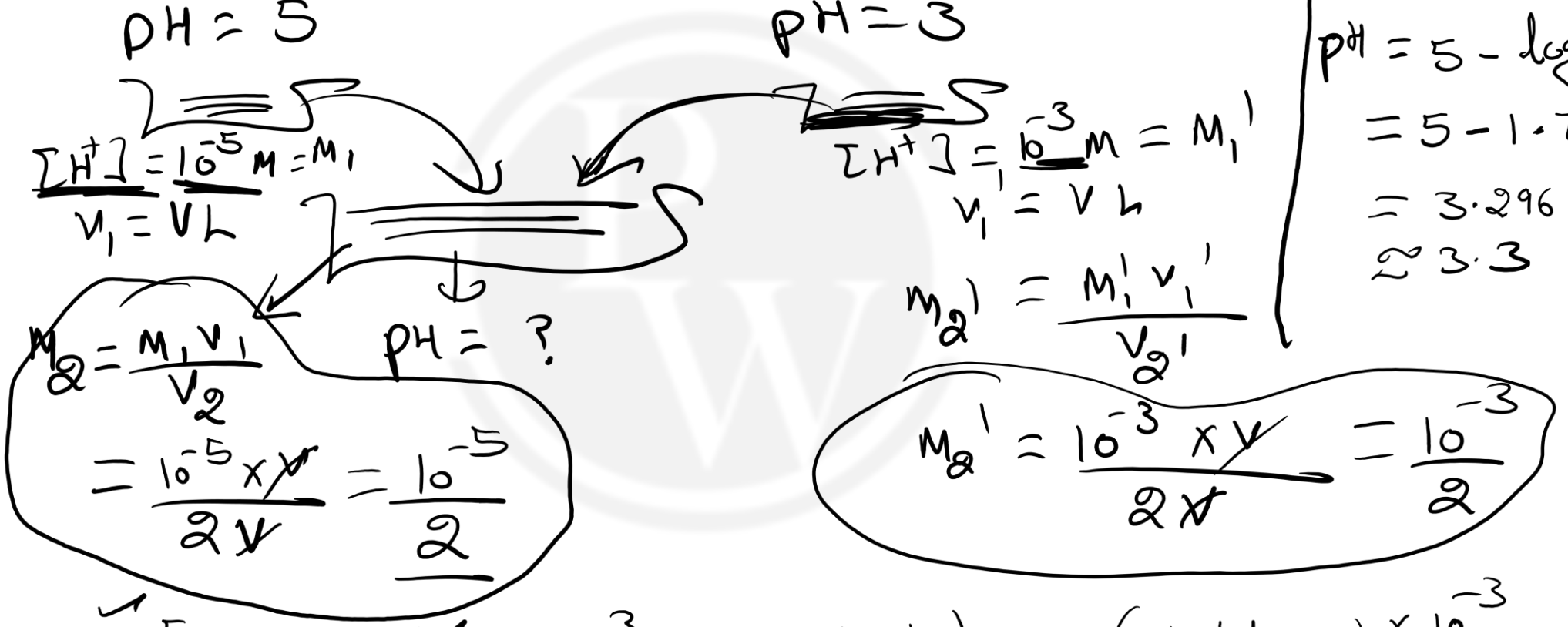
geq of $NaOH = \frac{250}{1000} \times \frac{4 \times 1000}{40 \times 250} \times 1 = 0.1$

Ans. (1)

Question-

The pH of two solutions are 5 and 3 respectively. What will be the pH of the solution made by mixing the equal volumes of the above solutions

1. 3.5
2. 4.5
3. 3.3
4. 4.0



$[H^+]_{Total} = \frac{10^{-5}}{2} + \frac{10^{-3}}{2} = \frac{10^{-3}}{2}\left(\frac{1}{100} + 1\right) = \left(\frac{1+100}{100}\right) \times \frac{10^{-3}}{2}$

$[H^+] = \frac{101}{2} \times 10^{-5}$

$[H^+] = 50.5 \times 10^{-5}$

$pH = 5 - \log 50.5$

$= 5 - 1.7033$

$= 3.2967$

$\simeq 3.3$

Ans. (3)

Question-

S.A ✓ S.B.

The pH of the solution obtained by mixing 10 mL of 0.1 M HCl and 10 mL of 0.1 M NaOH is :

milli. eq of HCl = $10 \times 0.1 \times 1 = 1$ ✓

NaOH = $10 \times 0.1 \times 1 = 1$ ✓

Soln neutral ⇒ pH = 7 at 25°C

1. 8
2. 2
3. ~~3~~ 7
4. None of these

Ans. (3)

Question-

The pH of a solution is 2. Its pH is to be changed to 4. Then the H^+ concentration of original solution has to be:

1. Halved
2. Double
3. Increased by 100 times
4. Decreased by 100 times

$pH_{old} = 2$

$pH_{new} = 4$

pH ↑ $[H^+]$ ↓ $C = \frac{n}{V}$ V ↑

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

Conc. ↓ 2 3 Conc. ↓ 4

$[H^+] = 10^{-2} M = M_1$

$[H^+] = 10^{-4} M = M_2$

$M_1V_1 = M_2V_2$

$\frac{V_2}{V_1} = \frac{M_1}{M_2} = \frac{10^{-2}}{10^{-4}} = 10^2$

$V_2 = 100 V_1$

Ans. (4)

Question-

How many moles of HCl must be removed from 1 litre of aqueous HCl solution to change its pH from 2 to 3

1. 1
2. 0.02
3. 0.009
4. 0.01

n_{HCl} removed = ?

Conc. ten times ↓

2 ⟶ 3

10^{-2} ⟶ 10^{-3}

$\frac{10^{-2}}{10} = 10^{-3}$

10^{-2} ⟶ 10^{-3} = Conc. dec

$\frac{1}{100}$ ⟶ $\frac{1}{1000}$

$\frac{10 - 1}{1000}$ = Conc. dec.

$\frac{9}{1000}$ = Conc. dec.

0.009 = moles dec.

Ans. (3)

Question-

The concentration of a HCl solution is 10^{-2} M. If this solution is diluted ten times then its pH will

1. Become ten times
2. Become double
3. Increase by one unit
4. Decrease by one unit

$[HCl] = 10^{-2}\ M \Rightarrow pH = 2$

$M_1 = 10^{-2}\ M$

$V_1 = V\ L$

$V_2 = 10V\ L$

$M_2 = \frac{M_1V_1}{V_2} = \frac{10^{-2} \times V}{10V} = 10^{-3}\ M = [HCl]$

$\Downarrow$

$pH = 3$

Ans. (3)

Question-

1 cc of 0.1 N HCl is added to 99 cc solution of NaCl. The pH of the resulting solution will be

1ml of 0.1 N HCl mixed 99ml of NaCl ⇒ salt of S.A + S.B.

↓

neutral

$M_1V_1 = M_2V_2$

$0.1 \times 1 = M_2 \times 100$

$M_2 = \frac{0.1}{100} = 0.001 = 10^{-3}\ M\ HCl$

↓

$pH = 3$

1) 7
2) 3
3) 4
4) 1

Ans. (2)

Question-

pH of solution is 4. The hydroxide ion concentration of the solution would be

$pH = 4 \Rightarrow [H^+] = 10^{-pH} = 10^{-4}\ M$

$[OH^-] = \frac{K_w}{[H^+]} = \frac{10^{-14}}{10^{-4}} = 10^{-10}\ M$

1. 10^{-4}
2. 10^{-10}
3. 10^{-2}
4. 10^{-12}

Ans. (2)

Question-

S.A. S.B.

100 ml of 0.2 M H_2SO_4 is added to 100 ml of 0.2 M NaOH. The resulting solution will be

milli geq of $H_2SO_4 = 100 \times 0.2 \times 2 = 40$

$NaOH = 100 \times 0.2 \times 1 = 20$

milli geq of H_2SO_4 is more $\therefore$ Sol^n is acidic

1. Acidic
2. Basic
3. Neutral
4. Slightly basic

Ans. (1)

Question-

pH of a solution can be expressed as

1. $-\log_e [H^+]$
2. $-\log_{10} [H^+]$
3. $\log_e [H^+]$
4. $\log_{10} [H^+]$

$pH = -\log_{10}[H^+]$

Ans. (2)

Question-

An alcoholic drink substance has pH = 4.7 then OH^- ion concentration of this solution is ($K_w = 10^{-14}\ mol^2/l^2$)

1. 3×10^{-10}
2. 5×10^{-10}
3. 1×10^{-10}
4. 5×10^{-8}

$pH = 4.7$

$[H^+] = 10^{-pH} = 10^{-4.7} = 10^{-4} \times 10^{-0.7}$

$[H^+] = \frac{10^{-4}}{10^{0.7}}$

$= \frac{10^{-4}}{5} = 0.2 \times 10^{-4}$

$[H^+] = 2 \times 10^{-5}$

$[OH^-] = \frac{K_w}{[H^+]}$

$[OH^-] = \frac{10^{-14}}{2 \times 10^{-5}}$

$= 0.5 \times 10^{-9}$

$= 5 \times 10^{-10}$

$10^{0.3} = 2$ $\quad$ $10^{0.48} = 3$

Ans. (2)

Question-

Equal volumes of three acid solutions of pH 3, 4 and 5 are mixed in a vessel. What will be the H^+ ion concentration in the mixture?

1. 1.11×10^{-4} M
2. 1.11×10^{-4} M
3. 1.11×10^{-4} M
4. 1.11×10^{-4} M

pH = 3 $\Rightarrow [H^+] = 10^{-3}$ M $\Rightarrow$ new $[H^+]$ conc^n $= \frac{10^{-3}}{3}$

pH = 4 ——— 10^{-4} M $\Rightarrow$ ——— $= \frac{10^{-4}}{3}$

pH = 5 ——— 10^{-5} M $\Rightarrow$ ——— $= \frac{10^{-5}}{3}$

$$[H^+]_{Total} = \frac{10^{-3}}{3} + \frac{10^{-4}}{3} + \frac{10^{-5}}{3}$$

$$= \frac{10^{-3}}{3}\left(1 + \frac{1}{10} + \frac{1}{100}\right)$$

$$= \frac{10^{-3}}{3}\left(\frac{100 + 10 + 1}{100}\right) = \frac{111 \times 10^{-3}}{100 \times 3}$$

$$[H^+]_{Total} = \frac{1.11 \times 10^{-3}}{3}\ M$$

Ans. (2)

Question-

Aqueous solution of which salt has the lowest pH? ⇒ most acidic

1. $NaOH$ ✗
2. NH_4Cl salt of S·A + W·B ✓
3. Na_2CO_3 salt of S·B + W·A ✗
4. $NaCl$ ✗

$NH_4^+ + H_2O \rightarrow NH_4OH + H^+$

$CO_3^{2-} + H_2O \rightarrow H_2CO_3 + OH^-$

S·A + S·B ⇒ salt

Ans. (2)

Thank You...