DPP-7 [pH of Mixture]

Chapter: Ionic Equilibrium

"The future belongs to those who prepare for it today."

A: pH of Strong acid + Strong Acid

Q1. **Calculate the pH of solution obtained by mixing 10 mL of 0.2 M HCl and 40 mL of 0.1 M H_2SO_4.**

(1) 0.7
(2) 1.2
(3) 1.5
(4) 2.0

Q2. **10 mL of $\frac{M}{200}$ H_2SO_4 is mixed with 40 mL of $\frac{M}{200}$ H_2SO_4. The pH of the resulting solution is :-**

(a) 1
(b) 2
(c) 2.3
(d) none of these

Q3. **In the following solutions, the conc. of different acids are given, which mixture of the acid has highest pH :-**

(1) $\frac{M}{10}$ H_2SO_4, $\frac{M}{20}$ HNO_3, $\frac{M}{10}$ $HClO_4$
(2) $\frac{M}{20}$ H_2SO_4, $\frac{M}{10}$ HNO_3, $\frac{M}{20}$ $HClO_4$
(3) $\frac{M}{20}$ H_2SO_4, $\frac{M}{10}$ HNO_3, $\frac{M}{40}$ $HClO_4$
(4) $\frac{M}{20}$ H_2SO_4, $\frac{M}{5}$ HNO_3, $\frac{M}{5}$ $HClO_4$

Q4. **Calculate pH of mixture of (400 mL, $\frac{1}{200}$ M H_2SO_4) + (400 mL, $\frac{1}{100}$ M HCl) + (200 mL water). (Take log 2 = 0.3)**

(1) 2.2
(2) 1.8
(3) 2.5
(4) 3.0

Q5. **The pH of the solution produced when an aqueous solution of strong acid pH 5 is mixed with equal volume of an aqueous solution of strong acid of pH 3 is :-**

(1) 3.3
(2) 3.5
(3) 4.5
(4) 4.0

Q6. **When equal volumes of pH = 4 and pH = 6 are mixed together then the pH of the resulting solution will be (log 5 = 0.7) :-**

(1) 4.3
(2) 4.7
(3) 5
(4) 5.3

Q7. **If 100 mL of pH = 3 and 400 mL of pH = 3 is mixed, what will be the pH of the mixture :-**

(1) 3.2
(2) 3.0
(3) 3.5
(4) 2.8

Q8. **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) 3.7×10^{-4} M
(2) 3.7×10^{-3} M
(3) 1.11×10^{-3} M
(4) 1.11×10^{-4} M

Q9. **In 10 mL of pH = 4 HCl solution 990 mL of 0.2 M NaCl solution is added. The pH of resulting solution will be :-**

(1) pH = 5
(2) pH = 5.5
(3) pH = 6
(4) pH = 4

Q10. **Following five solution of KOH were prepared as –**

First → 0.1 moles in 1 L
Second → 0.2 moles in 2 L
Third → 0.3 moles in 3 L
Fourth → 0.4 moles in 4 L
Fifth → 0.5 moles in 5 L

The pH of resultant solution is :-

(1) 2
(2) 1
(3) 13
(4) 7

Q11. **Which statement/relationship is correct ?**

(a) pH of aqueous solutions of 0.1 M HNO_3, 0.1 M HCl, 0.1 M HI at 25°C is not equal
(b) For a dilute solution, $pH = -\log \frac{1}{[H^+]}$
(c) At 25°C, the pH of pure water is 7.
(d) The value of pK_w at 25°C is 7.

B: pH of Strong acid + Strong Base

Q12. **Upon mixing equal volume of a strong acid solution (HA) and a strong base (BOH)**

solution, pH of resulting solution :

(1) May be less than 7
(2) May be greater than 7
(3) Will be equal to 7
(4) Both (1) and (2)

Q13. What is the $[OH^-]$ in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M $Ba(OH)_2$?

(1) 0.12 M
(2) 0.10 M
(3) 0.40 M
(4) 0.0050 M

Q14. Find concentration of $[H^+]$ after mixing of 15 mL 0.1 M H_2SO_4 and 15 mL 0.1 M NaOH :

(1) 5×10^{-2}
(2) 10^{-7}
(3) 1×10^{-2}
(4) 2×10^{-2}

Q15. If 100 mL of 1N H_2SO_4 were mixed with 100 mL of 1N NaOH, the solution will be :

(1) Acidic
(2) Basic
(3) Neutral
(4) Slightly acidic

Q16. The pH of the solution containing 10 mL of a 0.1 M NaOH and 10 mL of 0.05 M H_2SO_4 would be:

(1) Zero
(2) 1
(3) >7
(4) 7

Q17. 25 mL, 0.2 M $Ca(OH)_2$ is neutralised by 10 mL of 1 M HCl. Then pH of resulting solution is –

(1) 1.37
(2) 9
(3) 12
(4) 7

Q18. What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed?

(1) 7.0
(2) 1.04
(3) 12.65
(4) 2.0

Q19. pH of solution formed by mixing 40 mL of 0.1 M HCl with 10 mL of 0.45 M NaOH is :

(1) 10
(2) 12

(3) 8
(4) 6

Q20. 8 g NaOH and 4.9 g H_2SO_4 are present in one litre of the solution. What is its pH?
(1) 1
(2) 13
(3) 12
(4) 2

Q21. The pH of a mixture of 100 mL 1M H_2SO_4 and 200 mL 1N NaOH at 25°C is :
(1) More than 7
(2) Less than 7
(3) Equal to 7
(4) Can't predict

Q22. Calculate the pH of the resulting solution formed by mixing the following solutions :
(a) 20 mL of 0.2 M $Ba(OH)_2$ + 30 mL of 0.1 M HCl
(b) 2 mL of 0.1 M HCl + 10 mL of 0.01 M $Sr(OH)_2$
(c) 10 mL of 0.1 M H_2SO_4 + 10 mL of 0.1 M KOH
(1) (a) 13, (b) 7, (c) 1.3
(2) (a) 7, (b) 13, (c) 1.3
(3) (a) 13, (b) 1.3, (c) 7
(4) (a) 1.3, (b) 7, (c) 13

Q23. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations:

(a) 60 mL M/10 HCl + 40 mL M/10 NaOH
(b) 55 mL M/10 HCl + 45 mL M/10 NaOH
(c) 75 mL M/5 HCl + 25 mL M/5 NaOH
(d) 100 mL M/10 HCl + 100 mL M/10 NaOH

pH of which one of them will be equal to 1?
(1) b
(2) a
(3) d
(4) c

Q24. Calculate pH of mixture of (400 mL, $\frac{M}{200}$ $Ba(OH)_2$) + (400 mL, $\frac{M}{50}$ HCl) + (200 mL of water).
(1) 2.4
(2) 4
(3) 8
(4) 10

Q25. What will be the resultant pH when 200 mL of an aqueous solution of HCl (pH = 2.0) is mixed with 300 mL of an aqueous solution of NaOH (pH = 12.0)? [JEE 1998]
(1) 1.3
(2) 7
(3) 11.3
(4) 13

Q26. **What volume of 0.1 M H_2SO_4 is needed to completely neutralize 40 mL of 0.2 M NaOH solution?**

(1) 10 mL
(2) 40 mL
(3) 20 mL
(4) 80 mL

C: pH of Strong acid + Weak Acid

Q27. **The pH of a mixture of 0.01 M HCl and 0.1 M CH_3COOH is approximately**

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

Q28. **The dissociation constant of 0.01 M CH_3COOH is 1.8×10^{-5}, then calculate CH_3COO^- concentration in 0.1 M HCl solution.**

(1) 1.8×10^{-6}
(2) 1.8×10^{-5}
(3) 1.8×10^{-4}
(4) 1.8×10^{-7}

Q29. **Calculate the percentage ionization of 0.01 M acetic acid in 0.1 M HCl. K_a of acetic acid is 1.8×10^{-5}.**

(1) 0.18%
(2) 0.018%
(3) 1.8%
(4) 18%

Q30. **If the value of K_a of 1 M HCN is 10^{-5} then its degree of dissociation in 0.1 M HCl will be ($\alpha \ll 1$)**

(1) 10^{-5}
(2) 10^{-4}
(3) 10^{-3}
(4) 10^{-2}

D: pH of Weak acid + Weak Acid

Q31. **Calculate pH of following solutions : 0.1 M HA + 0.1 M HB — $K_a(HA) = 2\times10^{-5}$; $K_b(HB) = 4 \times 10^{-5}$; [log $\sqrt{6}$ = 0.39]**

(1) 2.61
(2) 3.1
(3) 1.9
(4) 6.2

Q32. **pH of a solution obtained by mixing equal volumes of 0.1 M Triethyl amine ($K_b = 6.4 \times 10^{-5}$) and 0.1 M NH_4OH ($K_b = 1.8 \times 10^{-5}$) will be :**

(1) 11.3

(2) 10.3
(3) 12.3
(4) 11.45

Q33. Consider an aqueous solution, 0.1 M each in HOCN, HCOOH, $(COOH)_2$ and H_3PO_4. For HOCN, we can write : $K_a(HOCN) = \frac{[H^+][OCN^-]}{[HOCN]}$. $[H^+]$ in this equation is :

(A) H^+ ions released by HOCN
(B) Sum of H^+ ions released by all monoprotic acids
(C) Sum of H^+ ions released only after the first dissociation of all the acids
(D) Overall H^+ ion concentration in the solution

Q34. What are $[H^+]$, $[A^-]$ and $[B^-]$ in a solution that contains 0.03 M HA and 0.1 M HB. K_a for HA and HB are 3.0×10^{-4} and 1.0×10^{-10} respectively.

(A) $H^+ = 3 \times 10^{-3}$ M
(B) $A^- = 3 \times 10^{-3}$ M
(C) $B^- = 3.33 \times 10^{-9}$ M
(D) All of these

Q35. Calculate $[H^+]$, $[CH_3COO^-]$ and $[C_6H_5O_2^-]$ in a solution that is 0.02 M acetic acid and 0.01 M benzoic acid. K_a(acetic) = 1.8×10^{-5} , K_a(benzoic) = 6.4×10^{-5}.

(1) $[H^+] = 10^{-3}$ M, $[CH_3COO^-] = 3.6 \times 10^{-4}$ M, $[C_6H_5O_2^-] = 6.4 \times 10^{-4}$ M
(2) $[H^+] = 10^{-4}$ M, $[CH_3COO^-] = 3.6 \times 10^{-5}$ M, $[C_6H_5O_2^-] = 6.4 \times 10^{-5}$ M
(3) $[H^+] = 10^{-2}$ M, $[CH_3COO^-] = 3.6 \times 10^{-3}$ M, $[C_6H_5O_2^-] = 6.4 \times 10^{-3}$ M
(4) None of these