



DPP-11 [Salt Hydrolysis – 2 (Calculations)]

Chapter: Ionic Equilibrium

“A topper isn't born — they just do the boring things consistently.”

GROUP 1: Strong acid + Strong base salt

Q1. At 90°C, the pH of 0.1M NaCl aqueous solution is :

- (1) <7
- (2) >7
- (3) 7
- (4) 0.1

GROUP 2: WEAK ACID + STRONG BASE SALT

Q2. The pH of aqueous solution of sodium acetate is :

- (1) 7
- (2) Very low
- (3) >7
- (4) <7

Q3. For anionic hydrolysis, pH is given by :-

- (1) $\text{pH} = \frac{1}{2} \text{pK}_w - \frac{1}{2} \text{pK}_b - \frac{1}{2} \log c$
- (2) $\text{pH} = \frac{1}{2} \text{pK}_w + \frac{1}{2} \text{pK}_a - \frac{1}{2} \text{pK}_b$
- (3) $\text{pH} = \frac{1}{2} \text{pK}_w + \frac{1}{2} \text{pK}_a + \frac{1}{2} \log c$
- (4) None of above

Q4. If pK_b for CN^- at 25°C is 4.7. The pH of 0.5M aqueous NaCN solution is :

- (1) 12
- (2) 10
- (3) 11.5
- (4) 11

Q5. Assuming small hydrolysis, pH of 0.1 M sodium acetate ($\text{K}_a = 1 \times 10^{-5}$) is :

- (1) 5.0
- (2) 6.0
- (3) 8.0
- (4) 9.0

Q6. Hydroxyl ion concentration $[\text{OH}^-]$ in the case of sodium acetate can be expressed as :-

- (1) $(C K_w K_a)^{1/2}$
- (2) $C K_w / K_a$
- (3) $\left(\frac{C K_w}{K_a}\right)^{1/2}$

(4) $C K_w / K_a$

- Q7. Degree of Hydrolysis of $\frac{N}{100}$ solution of KCN is (Given $K_a = 1.4 \times 10^{-9}$) :
- (1) 2.7×10^{-3}
 - (2) 2.7×10^{-2}
 - (3) 2.7×10^{-4}
 - (4) 2.7×10^{-5}
- Q8. Which of the following salts is most basic in aqueous solution?
- (1) FeCl_3
 - (2) $\text{Pb}(\text{CH}_3\text{COO})_2$
 - (3) $\text{Al}(\text{CN})_3$
 - (4) CH_3COOK
- Q9. Four separate solutions of sodium salts NaW, NaX, NaY and NaZ have pH 7, 9, 10 and 11 respectively, when each solution has concentration 0.1 M. Then the strongest acid is :
- (1) HW
 - (2) HX
 - (3) HY
 - (4) HZ
- Q10. $\text{HCOO}^- + \text{H}_2\text{O} \rightleftharpoons \text{HCOOH} + \text{OH}^-$ is related :-
- (1) $h = \sqrt{K_h}$
 - (2) $h = \sqrt{\frac{K_h}{C}}$
 - (3) $h = \sqrt{\frac{K_h}{V}}$
 - (4) $K_h = \sqrt{hC}$
- Q11. If equilibrium constant for $\text{HA} + \text{strong base}$ is 10^9 , determine pH of 0.1 M NaA.
- Q12. A weak acid reacts with strong base, ionisation constant of weak acid is 10^{-4} . Find out equilibrium constant for this reaction :-
- (1) 10^{-10}
 - (2) 10^{10}
 - (3) 10^{-9}
 - (4) 10^9

GROUP 3: STRONG ACID + WEAK BASE SALT

- Q13. Aqueous solution of NH_4Cl is ____ in nature due to behaviour of ____ ion in solution :
- (A) acidic ; NH_4^+ (B) alkaline ; NH_4^+
(C) acidic ; Cl^- (D) alkaline ; Cl^-
- Q14. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is :-
- (1) 5.65×10^{-12}
 - (2) 5.65×10^{-10}
 - (3) 6.50×10^{-12}
 - (4) 5.65×10^{-13}
- Q15. 0.02M of pyridinium hydrochloride having $[\text{H}^+]$ is 5.55×10^{-6} what is ionisation constant of pyridine.

- (1) 1.54×10^{-9}
- (2) 1.54×10^{-7}
- (3) 1.54×10^{-6}
- (4) 1.54×10^{-5}

Q16. The chloride salt of a certain weak monoacidic organic base is hydrolysed to an extent of 3% in its 0.1M solution at 25°C. Given $K_w=10^{-14}$, the dissociation constant of the base is :

- (1) 1×10^{-10}
- (2) 1×10^{-9}
- (3) 3.33×10^{-9}
- (4) 3.33×10^{-10}

GROUP 4: WEAK ACID + WEAK BASE SALT

Q17. pH of which salt is same for 1 M and 5 M solution both?

- (1) HCOONa
- (2) $C_6H_5NH_3Cl$
- (3) NH_4CN
- (4) NaCN

Q18. What will be the pH of 1.0 M ammonium formate solution, If $K_a = 1 \times 10^{-4}$ and $K_b = 1 \times 10^{-5}$:

- (1) 6.5
- (2) 7.5
- (3) 8.0
- (4) 9.0

Q19. Calculate pH of salt of weak monoacidic acid and weak monoacidic base (0.1M), $pK_a=4.8$, $pK_b=5.2$:

- (1) 7.2
- (2) 6.8
- (3) 9.6
- (4) 7

Q20. The pK_a of HA is 4.80; pK_b of BOH is 4.78. pH of BA salt is :

- (1) 9.58
- (2) 4.79
- (3) 7.01
- (4) 9.22

Q21. Given $K_a(HA)=10^{-6}$, $K_b(MOH)=10^{-6}$, pH of 0.1 M MA is :

- (1) 5
- (2) 7
- (3) 9
- (4) 2

Q22. $pK_a(CH_3COOH)=4.78$ and $pK_b(NH_4OH)=4.7$. pH of ammonium acetate is :

- (1) 8.04
- (2) 6.02
- (3) 7.04

(4) 5.04

Q23. pK_a of weak acid 4.80, pK_b of weak base 4.78. pH of salt BA is :

(1) 4.79

(2) 7.01

(3) 9.22

(4) 9.58

Q24. $pK_a(HA)=3.2$, $pK_b(BOH)=3.4$. pH of AB salt is :

(1) 6.9

(2) 7.0

(3) 1.0

(4) 7.2

Q25. When 10 mL of 0.1 M acetic acid ($pK_a=5.0$) is titrated with 10 mL 0.1 M ammonia ($pK_b=5.0$), equivalence pH is :

(1) 6.0

(2) 7.0

(3) 9.0

(4) 4.0

Q26. The degree of hydrolysis of a salt of weak monoacidic acid and weak monoacidic base in 0.1 M solution is 50%. If the molarity is 0.2 M, percentage hydrolysis is :

(1) 100%

(2) 50%

(3) 25%

(4) None of these

Q27. What is concentration of CH_3COOH in solution prepared by dissolving 0.01 mol $NH_4^+CH_3COO^-$ in 1 L water? Multiply final answer by 9×10^5 .

Given $K_a(CH_3COOH)=1.8 \times 10^{-5}$; $K_b(NH_3.H_2O)=1.8 \times 10^{-5}$.