PHYSICAL CHEMISTRY

NEET

CRASH COURSE

IONIC EQUILIBRIUM

SMART ACHIEVERS

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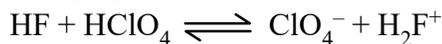
IONIC EQUILIBRIUM

Q.1 The following equilibrium is established when $HClO_4$ is dissolved in weak acid HF.

$$HF + HClO_4 \rightleftharpoons ClO_4^- + H_2F^+$$

Which of the following is correct set of conjugate acid base pair ?

(1) HF and $HClO_4$
(2) HF and ClO_4^-
(3) HF and H_2F^+
(4) $HClO_4$ & H_2F^+

Q.2 In the above reaction, identify bronsted base :

(1) HPO_4^{2-} and HCO_3^-
(2) H_2CO_3 and HCO_3^-
(3) $H_2PO_4^-$ and HCO_3^-
(4) $H_2PO_4^-$ and H_2CO_3

Q.3 Boric acid H_3BO_3 is a :

(1) Arrhenius acid
(2) Bronsted acid
(3) Lewis acid
(4) All of these

Q.4 Identify the amphoteric species from the following :

(I) H_2O (II) NH_3 (III) $H_2PO_4^-$ (IV) HCO_3^-

(1) I, II   (2) III, IV   (3) I, II, III   (4) I, II, III, Iς

Q.5 pH of NaCl solution is 7 at 298K. If the solution is heated to 320K, which of the following statement is true?

(1) pH will decrease
(2) pOH will increase
(3) pH will increase
(4) pH will decrease and pOH will increase

Q.6 Aniline is a very weak base. Which of the given aniline solution will have highest degree of dissociation.

(1) 1M aniline
(2) 0.1 M aniline
(3) 0.01 M aniline
(4) 0.02 M aniline

Q.7 Ostwald's dilution law gives satisfactory results with the solution of the electrolyte

(1) HCl   (2) HNO_3 (3) CH_3COOH (4) NaOH

Q.8 Which solution has pH exactly equal to 6 at 25ºC ?

(1) 10^{-6} M CH_3COOH solution
(2) 10^{-8} M NaOH solution
(3) 10^{-6} M H^+ solution
(4) 5×10^{-7} M H_2CO_3 solution

Q.9 The pH of solution obtained by mixing 500 ml of 0.3 N H_2SO_4 with 500 ml of 0.1 N NaOH is :

(1) 0   (2) 1   (3) 2   (4) 7

Q.10 The concentration of H^+ in 10^{-3} M NaOH is :

(1) 10^{-7} (2) 10^{-3} (3) 10^{-11} (4) 10^{-5}

Q.11 10^{-6} M HCl is diluted to 100 times. Its pH is :

(1) 6.0   (2) 8.0   (3) 6.95   (4) 9.5

Q.12 The ionisation constant of a tribasic acid is K_a. If its first second and third ionisation constant are K_{a_1}, K_{a_2} and K_{a_3} respectively then :

(1) $K_a = K_{a_1} \times K_{a_2} \times K_{a_3}$ (2) $K_a = \dfrac{K_{a_1}}{K_{a_2} \times K_{a_3}}$

(3) $K_{a_2} = \dfrac{K_{a_1} \times K_a}{K_{a_3}}$ (4) None of these

Q.13 100 ml of 1M HCl is mixed with 900 ml of 0.1 M NaOH. In the final solution :

(1) $[H^+] = 10^{-1}$ M   (2) $[Cl^-] = 10^{-1}$M

(3) $[Na^+] = [Cl^-]$ (4) $[OH^-] = 10^{-2}$ M

Q.14 Which of the following salts undergo anionic hydrolysis ?

(1) Na_3PO_4 (2) NaCl   (3) NH_4Cl (4) $FeSO_4$

Q.15 Which of the following is an acidic salt

(1) Na_2SO_4 (2) Ca(OH)Cl   (3) Pb(OH)Cl   (4) Na_2HPO_4

Q.16 What is the pH of an aqueous solution of ammonium acetate ($K_a = K_b = 1.8 \times 10^{-5}$)

(1) > 7   (2) 7.0   (3) < 7.0   (4) Zero

Q.17 If $pK_b > pK_a$ then the solution of the salt of weak acid and weak base will be –

(1) Neutral   (2) Acidic   (3) Basic   (4) Amphoteric

Q.18 The pH of 0.01 M ammonium sulphate solution is $[K_b NH_3] = 2 \times 10^{-5}$

(1) 5.5   (2) 6.8   (3) 8.6   (4) 7

Q.19 The pH of 0.01 M sodium acetate solution is $[K_a(CH_3COOH] = 2 \times 10^{-5}$

(1) 7.25   (2) 6.5   (3) 8.05   (4) 8.35

Q.20 Find out pH of solution having 2×10^{-3} moles of OH^- ion's in 2 litre solution :-

(1) pH = 3   (2) pH = 3 + log2   (3) pH = 3 – log2   (4) pH = 11

Q.21 The pH of 0.1 M solution of the following salts increases in the order:

(1) NaCl < NH_4Cl < NaCN < HCl

(2) HCl < NH_4Cl < NaCl < NaCN

(3) NaCN < NH_4Cl < NaCl < HCl

(4) HCl < NaCl < NaCN < NH_4Cl

Q.22 $H_2CO_3 + NaHCO_3$ found in blood helps in maintaining pH of the blood close to 7.4. An excess of acid entering the blood stream is removed by –

(1) HCO_3^- (2) H_2CO_3

(3) H^+ ion   (4) CO_3^{2-} ion

Q.23 The pH of 1 litre solution containing 0.5 M NH_4OH and 0.5 M NH_4Cl ($PK_b = 5$)

(1) 5   (2) 9   (3) 5 ± 1 (4) 9 ± 1

Q.24 Which may be added to one litre of water to act a buffer:

(1) One mole of CH_3COOH and one mole of HCl

(2) One mole of NH_4OH and one mole of NaOH

(3) One mole of NH_4Cl and one mole of HCl

(4) One mole of CH_3COOH and 0.5 mole of NaOH

Q.25 The pH of an acidic buffer mixture is:

(1) > 7   (2) < 7

(3) = 7   (4) Depends upon K_a of acid

Q.26 A certain buffer solution contains equal concentration of X^- and HX. The K_b for X^- is 1×10^{-10}. The pH of the buffer is –

(1) 4   (2) 7   (3) 10   (4) 14

Q.27 The total number of different kind of buffers obtained during the titration of H_3PO_4 with NaOH are:

(1) 3   (2) 1   (3) 2   (4) Zero

Q.28 If K_{sp} (AgCl) is 10^{-10}, then which of the solution are saturated with AgCl ?

(1) $[Ag^+] = 10^{-10}$, $[Cl^-] = 1M$ (2) $[Ag^+] = 10^{-11}$, $[Cl^-] = 1M$

(3) $[Ag^+] = 10^{-6} M$ $[Cl^-] = 10^{-5} M$ (4) $[Ag^+] = 10^{-2}M$, $[Cl^-] = 10^{-8.5}M$

Q.29 The aqueous solution of which of the following sulphides would contain maximum concentration of S^{2-} ions:

(1) MnS ($K_{sp} = 1.1 \times 10^{-21}$)   (2) ZnS ($K_{sp} = 1.1 \times 10^{-23}$)

(3) PbS ($K_{sp} = 1.1 \times 10^{-35}$)   (4) CuS ($K_{sp} = 1.1 \times 10^{-30}$)

Q.30 K_b of aniline is 10^{-10}. A solution containing equal moles of aniline and aniline chloride will be :

(1) basic   (2) neutral

(3) acidic   (4) can't be predicted

Q.31 1M weak monoacidic base (BOH) solution is diluted by 100 times, The pH change of the solution ($K_b = 10^{-5}$) is :

(1) 2   (2) – 2   (3) 1   (4) –1

Q.32 In water, the acid $HClO_4$. HCl, H_2SO_4 and HNO_3 exhibit the same strength as they are completely ionised in water (a base). This is called.......of the solvent water.
(1) Strength
(2) Capacity
(3) Buffer effect
(4) Levelling effect

Q.33 If α is the degree of dissociation of weak dibasic organic acid and y is the hydrogen ion concentration, what is the initial concentration of acid :-

(1) $\dfrac{\alpha(y)^{-1}}{2}$
(2) $y(\alpha)^{-1}$
(3) $\dfrac{y(\alpha)^{-1}}{2}$
(4) None of them

Q.34 At 90^0C, pure water has $[H_3O^+]=10^{-6.7}$ mol L^{-1} what is the value of K_W at 90^0C:-
(1) 10^{-6}
(2) 10^{-12}
(3) 10^{-67}
(4) $10^{-13.4}$

Q.35 At 373 K, temp. the pH of pure H_2O can be:-
(1) < 7
(2) > 7
(3) $= 7$
(4) $= 0$

Q.36 Choose the correct relation:-

(1) $\dfrac{pH + pOH}{14} = 7$
(2) $pH + pOH = 14$
(3) $pOH = 14 + pH$
(4) $pH = 14 + pOH$

Q.37 The conjugate base of $H_2PO_4^-$ is
(1) PO_4^{3-}
(2) P_2O_5
(3) H_3PO_4
(4) HPO_4^{2-}

Q.38 What is the conjugate base of OH^-?
(1) O_2
(2) H_2O
(3) O^-
(4) O^{2-}

Q.39 How many litres of water must be added to 1 litre an aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2 ?
(1) 0.1 L
(2) 0.9 L
(3) 2.0 L
(4) 9.0 L

Q.40 For a sparingly soluble salt A_pB_q, the relationship of its solubility product (L_s) with its solubility (S) is :
(1) $L_S = S^{p+q} \cdot p^p \cdot q^q$
(2) $L_S = S^{p+q} \cdot p^q \cdot q^p$
(3) $L_S = S^{pq} \cdot p^p \cdot q^q$
(4) $L_S = S^{pq} \cdot (pq)^{p+q}$

ASSERTION & REASON

Directions : Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

(3) If Assertion is true but reason is false.

(4) If both assertion and reason are false.

Q.41 **Assertion :** pH of x M HCl is less than pH of x M CH_3COOH.

Reason : The degree of ionization of HCl and CH_3COOH are equal at infinite dilution.

Q.42 **Assertion :** The degree of dissociation of a weak base increases on dilution.

Reason : The value of K_b increases on dilution

Q.43 **Assertion :** The conjugate acid base pair differ by a proton.

Reason : NH_2^- and NH_4^+ are conjugate acid base pair.

Q.44 **Assertion :** The degree of dissociation of CH_3COOH is more in a solution which is basic than in water.

Reason : K_a of CH_3COOH increases in basic solution.

Q.45 **Assertion :** pH of 10^{-7} M NaOH solution exists between 7 to 7.3 at 25°C.

Reason : Due to common ion effect ionization of water is reduced.

(1) A (2) B (3) C (4) D

ANSWER KEY

Q.1 3	Q.2 1	Q.3 3	Q.4 4	Q.5 1	Q.6 3	Q.7 3
Q.8 3	Q.9 2	Q.10 3	Q.11 3	Q.12 1	Q.13 2	Q.14 1
Q.15 4	Q.16 2	Q.17 2	Q.18 1	Q.19 4	Q.20 1	Q.21 2
Q.22 1	Q.23 2	Q.24 4	Q.25 4	Q.26 1	Q.27 1	Q.28 1
Q.29 1	Q.30 3	Q.31 4	Q.32 4	Q.33 3	Q.34 4	Q.35 1
Q.36 2	Q.37 4	Q.38 4	Q.39 4	Q.40 1	Q.41 2	Q.42 3
Q.43 3	Q.44 3	Q.45 1				