CHEMISTRY

BOOKS - NARENDER AVASTHI CHEMISTRY (ENGLISH)

IONIC EEQUILIBRIUM

Level 1

1. Morphine $(C_{17}H_{19}NO_3)$, Which is used medically to relieve to pain is a base. What is its conjugate acid?

A. $C_{17}H_{18}NO_3^+$

B. $C_{17}H_{18}NO_3$

C. $C_{17}H_{20}NO_3^-$

D. $C_{17}H_{20}NO_3^+$

Answer: D

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2. The conjugate base of $H_2PO_4^-$ is :

A. H_3PO_4

B. $H_2PO_4^-$

C. HPO_4^{2-}

D. PO_4^{3-}

Answer: C

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3. The strongest Bronsted base in the following anion is:

A. CN^-

B. Cl^-

C. I^-

D. Br^-

Answer: A

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4. What salt can furnish H^+ in its aqueous solution?

A. NaH_2PO_2

B. Na_2HPO_3

C. Na_2HPO_4

D. All of these

Answer: C

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5. Which is the set of amphiprotic species?

A. $H_3O^+, HPO_4^{2-}, HCO_3^-$

B. $H_2O, HPO_3^{2-}, H_2PO_2^-$

C. $H_2PO_4^-, H_2PO_3^-, H_2O$

D. All of these

Answer: C

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6. The K_a values for HPO_4^{2-} and HSO_3^- are 4.8×10^{-13} and 6.3×10^8 repectively. Therefore, it follows the HPO_4^{2-} is ... acid than HSO_3^- and PO_4^{3-} is a ..... base than SO_3^{2-}

A. weaker, stronger

B. stronger, weaker

C. weaker, weaker

D. stronger, stronger

Answer: A

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7. Given the following K_a values, determine which species is the strongest base ?

$HSO_4^- = 1.2 \times 10^{-2}, H_2PO_4^- = 6.3 \times 10^{-8}, HCO_3^- = 4.7 \times 10^{-11}$

(a)CO_3^{2-}

(b)H_2SO_4

(c)SO_4^{2-}

(d)HPO_4^{2-}

A. CO_3^{2-}

B. H_2SO_4

C. SO_4^{2-}

D. HPO_4^{2-}

Answer: A

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8. Given that K_w for water is $10^{-13}\ M^2$ at 62° C, compute the sum of pOH and pH for a neutral aqueous solution at 62° C:

(a)7.0

(b)13.30

(c)14.0

(d)13.0

A. 7.0

B. 13.30

C. 14.0

D. 13.0

Answer: D

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9. The value of the ion product constant for water, (K_w) at 60°C is $9.6 \times 10^{-14}\ M^2$ what is the $\left[H_3O^+\right]$ of a neutral aqueous solutoin at 60°C and an aqueous solution with a pH=7.0 at 60°C are respectively?

A. 3.1×10^{-8} acidic

B. 3.1×10^{-7}, neutral

C. 3.1×10^{-8}, basic

D. 3.1×10^{-7}, basic

Answer: D

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10. For pure water:

A. pH increases while pOH decreases with rise in temperature

B. pH decreases while pOH increases with rise in temperature

C. both pH and pOH decreases with rise in temperature

D. both pH and pOH increases with rise in temperature

Answer: C

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11. A beer has a pH of 4.30. What is the $\left[H_3O^+\right]$?

(a)3.0×10^{-4}

(b)2.0×10^{-4}

(c)2.0×10^{5}

(d)5.0×10^{-5}

A. 3.0×10^{-4}

B. 2.0×10^{-4}

C. 2.0×10^{5}

D. 5.0×10^{-5}

Answer: D

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12. The hydrogen ion concentration of the oceans is about 2×10^{-9} M. What is the pH?

A. 8.85

B. 9.3

C. 7.85

D. 8.7

Answer: D

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13. The hydroxide ion concentration of a wine is 8×10^{-11} M. What is the pH of the wine?

A. 2.10

B. 2.9

C. 3.9

D. 4.9

Answer: C

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14. The pH of a solution is 5. to this solution acid was added so that its pH value bcomes 2.0. The increase in H^+ concentration is :

A. 100 times

B. 5 times

C. 2.5 times

D. 1000 times

Answer: D

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15. A solution has a pH=9. It is 1000 times more basic than the original solution. What was the pH of the original solution?

A. 12

B. 6

C. 9

D. 10

Answer: B

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16. Equal volumes of two HCl solutions of $pH = 3$ and $pH = 5$ were mixed. What is the pH of the resulting solution ?

A. 3.5

B. 4.0

C. 4.5

D. 3.3

Answer: D

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17. pOH of $0.002MHNO_3$ is :

A. $11 + \log 2$

B. $11 - \log 2$

C. $-3 + \log 2$

D. None of these

Answer: A

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18. Number of equivalents of HCl present in 100 mL of its solution whose pH is 4:

A. 10^{-4}

B. 10^{-3}

C. 10^{-2}

D. 10^{-5}

Answer: D

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19. To a $10mL$ of $10^{-3}NH_2SO_4$ solution water has been to make the total volume of one litre. Its pOH would be :

A. 3

B. 12

C. 9

D. 5

Answer: C

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20. The pH of a solution of H_2SO_4 is 1. Assuming complete ionisation, find the molarity of H_2SO_4 solution :

A. 0.1

B. 0.2

C. 0.05

D. 2.0

Answer: C

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21. pH of a strong diprotic acid (H_2A) at concentrations:

(i) 10^{-4} M, (ii) 10^{-4} N

are respectively:

A. 3.7 and 4.0

B. 4 and 3.7

C. 4 and 4

D. 3.7 and 3.7

Answer: A

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22. Calcium hydroxide is a strong base. Compute $\left[Ca^{2+}\right]$ and $\left[OH^{-}\right]$ "for" a solution that is prepared by dissolving $0.60g$ of $Ca(OH)_2$ in enough water to make a 1500 mL of solution.

[Atomic mass : $Ca = 40, O = 16, H = 1$]

A. $5.4 \times 10^{-3}, 9.1 \times 10^{-13}$

B. $5.4 \times 10^{-3}, 1.08 \times 10^{-2}$

C. $5.4 \times 10^{-3}, 5.4 \times 10^{-3}$

D. $8.1 \times 10^{-3}, 8.1 \times 10^{-3}$

Answer: B

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23. pH of 10^{-6} M HCl (aq.) is :

A. just less then 6

B. exactly equal to 6

C. just greater than 6

D. just less than 7

Answer: B

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24. $10^{-5} MHCI$ solution at $25^{\circ} C$ is diluted 1000 times. The pH of the diluted solution will

A. be equal to 8

B. lie between 7 and 8

C. lie between 6 and 7

D. remain unchanged

Answer: C

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25. 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:

A. 7.0

B. 1.0

C. 2.0

D. 12.0

Answer: A

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26. A 25.0 mL. sample of 0.10 M HCl is titrated with 0.10 M NaOH. What is the pH of the solution at the points where 24.9 and 25.1 mL of NaOH have been added?

A. $3.70, 10.70$

B. $3.30, 10.30$

C. $3.70, 10.30$

D. $3.0, 11.0$

Answer: C

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27. What is the pH of solution in which 25.0 mL of 0.1 M NaOH is added to 25 mL of 0.08M HCl and final solution is diluted to 500 mL?

A. 3

B. 11

C. 12

D. 13

Answer: B

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28. What is the pH of a solution in which 10.0 mL of 0.010 M $Sr(OH)_2$ is added to 10.0 mL of 0.010 M HCl?

A. 2.30

B. 1.50

C. 11.70

D. 7.00

Answer: C

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29. At 90°C, pure water has $\left[H^+\right] = 10^{-6}$ M.If 100 mL of 0.2 M HCl is added to 200 mL of 0.1 M KOH at 90°C then pH of the resulting solution will be :

A. 5

B. 6

C. 7

D. None of these

Answer: B

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30. What change will occur for the following reaction if the hypochlorous acid solution is diluted from 0.1 to 0.01 M?

$$HOCl(aq.) + H_2O(l) \Leftrightarrow OCl^-(aq.) + H_3O + (aq.)$$

A. a decrease in the fraction of acid ionized

B. an increase in the fraction of acid ionized

C. no change in the fraction of acid ionized

D. we can not predict

Answer: B

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31. Given K_a values of 5.76×10^{-10} and 4.8×10^{-10} for NH_4^+ and HCN respectively. What is the equilibrium constant for the following reaction?

$$NH_4^+(aq.) + CN^-(aq.) \Leftrightarrow NH_3(aq.) + HCN(aq.)$$

A. 0.83

B. 1.2

C. 8.0×10^{-11}

D. 27.6×10^{-10}

Answer: B

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32. Which is the strongest acid (pK_a value is given)?

A. $HCOOH[3.77]$

B. $C_6H_5COOH[4.22]$

C. $CH_3COOH[4.7]$

D. $CH_3CH_2COOH[4.88]$

Answer: A

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33. Given : Enthalpy of ioinization of two acids :

$\triangle H^{\circ}(HCN) = 45.2KJmol^{-}$

$\triangle H^{\circ}(CH_3COOH) = 2.1KJmol^{-}$

which relationshop for the two acids is true ?

A. $pK_a(HCN) = pK_a(CH_3COOH)$

B. $pK_a(HCN) > pK_a(CH_3COOH)$

C. $pK_a(HCN) < pK_a(CH_3COOH)$

D. $pK_a(HCN) = \frac{45.2}{2.1} pK_a(CH_3COOH)$

Answer: B

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34. What is the hydronium ion concentration of a 0.25 M HA solution? $\left(K_a = 4 \times 10^{-8}\right)$

A. 10^{-4}

B. 10^{-5}

C. 10^{-7}

D. 10^{-10}

Answer: A

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35. What is the precent dissociation (α) of a 0.01 M HA solution? $\left(K_a = 10^{-4}\right)$

A. $9.5\,\%$

B. $1\,\%$

C. $10.5\,\%$

D. $17\,\%$

Answer: A

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36. Given the two concentration of HCN $\left(K_a = 10^{-9}\right)$ are 0.1 M and 0.001 M respectively. What will be the ratio of degree of dissociation?

A. 1

B. 0.1

C. 0.003

D. 0.01

Answer: B

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37. A 0.10 M solution of HF is $8.0\,\%$ dissocaited What is the K_a?

A. 6.4×10^{-10}

B. 8.8×10^{-4}

C. 6.95×10^{-4}

D. 7.6×10^{-4}

Answer: C

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38. A weak base MOH of $0.1N$ concentration shows a pH value of 9 . What is the percentage degree of ionization of the base ?

A. $0.01\ \%$

B. $0.001\ \%$

C. $0.1\ \%$

D. $0.02\ \%$

Answer: A

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39. 0.01 M HA (aq.) is 2% dissociated, $\left[OH^-\right]$ of solution is :

A. 2×10^{-4}

B. 10^{-8}

C. 5×10^{-11}

D. 5×10^{-12}

Answer: C

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40. If degree of dissociation is 0.01 of decimolar solution of weak acid HA then pK_a of acid is :

A. 2

B. 3

C. 5

D. 7

Answer: C

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41. What concentration of $HCOO^-$ is present in a solution of weak of 0.01 M HCOOH $\left(K_a = 1.8 \times 10^{-4}\right.$ and 0.01 M HCl?

A. 1.8×10^{-3}

B. 10^{-2}

C. 1.8×10^{-4}

D. 10^{-4}

Answer: C

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42. Choose the correct code

	Column$-I$
(P)	pK_bofX^- $\left(K_a\text{of}HX = 10^{-6}\right)$
(Q)	$pH of 10^{-8} MHCl$
(R)	$pH of 10^{-2}$M acetic and acid solution$\left(Take K_a of aceticacid = 1.6 \times 1\right.$
(S)	pOH of a solution obtained by mixing equal volumes of solution with

A.

P	Q	R	S
1	2	4	3

B.

P	Q	R	S
4	3	2	1

C.

P	Q	R	S
2	1	4	3

D.

P	Q	R	S
1	2	3	4

Answer: C

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43. How much water must be added to $300mL$ of a $0.2M$ solution of CH_3COOH for the degree of dissociation of the acid to double ? (Assume K_a of acetic is of order of $10^{-5}M$)

A. 600 mL

B. 900 mL

C. 1200 mL

D. 1500 mL

Answer: B

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44. What is $\left[NH_4^+\right]$ in a solution that contain 0.02 M $NH_3\left(K_b = 1.8 \times 10^{-5}\right)$ and 0.01 M KOH?

A. 9×10^{-6}

B. 1.8×10^{-5}

C. 3.6×10^{-5}

D. None of these

Answer: C

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45. A hand book states that the solubility of RNH_2 (g) in water at 1 atm and 0°C is 22.41 litres volumes of RNH_2(g) per volume of water. $(pK_bofRNH_2 = 4)$ Find the max. pOH that can be attained by dissolving RNH_2 in water:

A. 1

B. 2

C. 4

D. 6

Answer: B

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46. The $\left[H^+\right]$ of a resulting solution that is 0.01 M acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$ and 0.01 M in benzoic acid $\left(K_a = 6.3 \times 10^{-5}\right)$:

A. 9×10^{-4}

B. 81×10^{-4}

C. 9×10^{-5}

D. 2.8×10^{-3}

Answer: A

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47. 6.0 g weak acid HA (mol.mass=60 g/mol.) is dissolved in water and formed 10 m^3 solution. If $K_a(HA) = 10^{-9}$, then pOH of solution is : [Given: log 4=0.6]

A. 7

B. greater than 6.7 and less than 7.0

C. greater than 7.0 and less than 7.3

D. greater than 7.3

Answer: A

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48. Carbonic acid (H_2CO_3), a diprotic acid has $K_{a1} = 4.0 \times 10^{-7}$ and $K_{a2} = 7.0 \times 10^{-11}$. What is the $\left[HCO_3^-\right]$ of a 0.025 M solution of carbonic acid?

A. 7.8×10^{-3}

B. 6.6×10^{-4}

C. 10^{-10}

D. 1.0×10^{-4}

Answer: D

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49. Carbonic acid (H_2CO_3), a diprotic acid has $K_{a1} = 4.0 \times 10^{-7}$ and $K_{a2} = 7.0 \times 10^{-11}$. What is the $\left[CO_3^{2-}\right]$ of a 0.025 M solution of carbonic acid?

A. 5.5×10^{-9}

B. 5.5×10^{-8}

C. 7.0×10^{-9}

D. 7.0×10^{-11}

Answer: D

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50. Selenious acid (H_2SeO_3), a diprotic acid has $K_{a1} = 3.0 \times 10^{-3}$ and $K_{a2} = 5.0 \times 10^{-8}$. What is the $\left[OH^-\right]$ of a 0.30 M solution of selenious acid?

A. 2.85×10^{-3}

B. 5.0×10^{-6}

C. 3.5×10^{-12}

D. 3.5×10^{-13}

Answer: D

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51. Which of the hydrated species may exist?

I : $H_5O_2^+$, II : H_3O^+ , III : $H_3O_2^-$, IV : $H_7O_3^+$

A. II only

B. I and II

C. I, II and IV

D. I, II, III and IV

Answer: D

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52. Consider the following salts. Which one(s) when dissolved in water will produce an acidic solution?

1. NH_4Cl , 2. $KHSO_4$, 3. $NaCN$, 4. KNO_3

A. 2 and 3

B. 1 and 2

C. only 3

D. 2 and 4

Answer: B

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53. Consider the following salts. Which one(s) when dissolved in water will produce a basic solution?

1. $RbClO_4$, 2. $NaNO_2$, 3. NH_4Cl , 4. $NaCl$

A. 1 and 3

B. only 3

C. 1 and 2

D. 3 and 4

Answer: B

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54. At 25°C dissociation constants of acid HA and base BOH in aqueous solution are same. The pH of 0.01 M solution of HA is 5. The pOH of 10^{-4} M solution of BOH at the same temperature is :

A. 3.5

B. 4

C. 6

D. None of these

Answer: C

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55. Which of the following solutions has the highest pH?

A. $0.2MHClO_4$

B. $0.20MCH_3COOH$

C. $0.020MHCl$

D. $0.2MNaCl$

Answer: D

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56. pH of solutions of four sodium salts NaW, NaX, NaY and NaZ were found to be 7.0, 9.0, 10.0 and 11.0 respectively. If each solution has concentration 0.1 M, the weakest acid is :

A. HW

B. HX

C. HY

D. HZ

Answer: D

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57. The pH values 0.1 M solution of HCOONa (I), HCOOH (II),CH_3COONH_4 (III), NaOH (IV) HCl (V), will be in the order :

A. $IV > III > I > II > V$

B. $IV > I > III > II > V$

C. $II > III > I > IV > V$

D. $V > II > III > I > IV$

Answer: B

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58. pH of an aqueous NaCl solution at 50° C should be :

A. 7

B. > 7

C. < 7

D. 0

Answer: C

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59. Upon hydrolysis of sodium carbonate, the reaction takes place between:

A. Na^+ and water

B. Na^+ and OH^-

C. CO_3^{2-} and water

D. CO_3^{2-} and H^+

Answer: C

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60. The solution of blue vitrol in water is acidic because:

A. $CuSO_4$ reacts with water

B. Cu^{2+} reacts with water

C. SO_4^{2-} reacts with water

D. $CuSO_4$ receives OH^- ions from water

Answer: B

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61. 1 mL of 0.1 N HCl is added to 999 mL solution of NaCl. The pH of the resulting solution will be :

A. 7

B. 4

C. 2

D. 1

Answer: B

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62. If a salt of strong acid and weak base hydrolyses appreciably $(\alpha = 0.1)$, which of the following formula is to be used to calculate degree of hydrolsis 'alpha'?

A. $\alpha = \frac{\sqrt{K_w}}{K_a . a}$

B. $\alpha = \frac{\sqrt{K_w}}{K_b . a}$

C. $\alpha = \frac{\sqrt{K_w}}{K_a . K_b}$

D. None of these

Answer: b

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63. The correct formula to calculate the hydroxyl ion concentration of an aqeous solution of NH_4NO_3 is:

A. $\sqrt{\frac{C \times K_w}{K_b}}$

B. $\sqrt{\frac{K_w \times K_b}{C}}$

C. $\sqrt{\frac{C \times K_w}{K_a}}$

D. $\sqrt{\frac{K_a \times K_w}{C}}$

Answer: B

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64. $\left[H^{+}\right] = \sqrt{\frac{K_w K_a}{C}}$ is suitable for

A. $NaCl, NH_4Cl$

B. $CH_3COONa, NaCN$

C. $CH_3COONa, (NH_4)_2SO_4$

D. $CH_3COONH_4, (NH_4)_2CO_3$

Answer: b

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65. What is the hydrolysis constant of the OCl^- ion? The ionization constant of $HOCl$ is 3.0×10^{-8}.

A. 3.33×10^{-8}

B. 3.33×10^{-7}

C. 3.0×10^{-7}

D. 3.33×10^{-6}

Answer: B

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66. What is the pH of a 0.10 M $C_6H_5O^-$ solution? The K_a of C_6H_5OH is 1.0×10^{-10}

A. 10.51

B. 11.04

C. 11.50

D. 12

Answer: C

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67. Calculate the $\left[OH^-\right]$ in $0.01M$ aqueous solution of $NaOCN(K_b$ for $OCN^- = 10^{-10})$:

(a)10^{-6} M

(b)10^{-7} M

(c)10^{-8} M

(d)None of these

A. 10^{-6} M

B. 10^{-7} M

C. 10^{-8} M

D. None of these

Answer: A

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68. What is the ionization constant of an acid if the hydronium ion concentration of a 0.40 M solution is 1.40×10^{-4} M?

(a)1.96×10^{-8}

(b)1.22×10^{-9}

(c) 4.90×10^{-8}

(d) 1.40×10^{-6}

A. 1.96×10^{-8}

B. 1.22×10^{-9}

C. 4.90×10^{-8}

D. 1.40×10^{-6}

Answer: C

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69. The degree of hydrolysis of 0.1 M RNH_3Cl solution is 1.0%. If the concentration of RNH_3Cl is made 0.4 M, what is the new degree of hydrolysis (in percentage)?

A. 0.01

B. 0.001

C. 0.2

D. 0.5

Answer: D

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70. % hydrolysis of 0.1M CH_3COONH_4, when $K_a(CH_3COOH) = K_b(NH_4OH) = 1.8 \times 10^{-5}$ is:

(a)0.55

(b)7.63

(c)0.55×10^{-2}

(d)7.63×10^{-3}

A. 0.55

B. 7.63

C. 0.55×10^{-2}

D. 7.63×10^{-3}

Answer: A

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71. The enthalpy of neutralisation of four acids HA,HB,HC and HD with NaOH are -13,-12,-11,-10 Kcal//mol. Which salt has maximum degree of hydrolysis?

A. 1 M NaA

B. 1 M NaB

C. 1 M NaC

D. 1 M NaD

Answer: D

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72. Calculate $\left[H^{+}\right]$ at equivalent point between titration of 0.1 M, 25 mL of weak acid HA $\left(K_{a(HA)=10^{-5}}\right.$ with 0.05 M NaOH solution:

(a)3×10^{-9}

(b)1.732×10^{-9}

(c)8

(d)10

A. 3×10^{-9}

B. 1.732×10^{-9}

C. 8

D. 10

Answer: B

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73. When a salt of weak acid and weak base is dissolved in water, the pH of the resulting solution will be :

(a)be 7

(b)be greater than 7

(c)be less than 7

(d)depend upon K_a and K_b values

A. be 7

B. be greater than 7

C. be less than 7

D. depend upon K_a and K_b values

Answer: D

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74. What will be the pH of an aqueous solution of 1.0 M ammonium formate?

Given :$pK_a = 3.8$ and $pK_b = 4.8$

A. 7.5

B. 3.4

C. 6.5

D. 10.2

Answer: C

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75. What will be the pH and $\% \alpha$ (degree of hydrolysis) respectively for the salt BA of $0.1M$ concentration ? Given : K_a for $HA = 10^{-6}$ and K_b for $BOH = 10^{-6}$

(a)$5, 1\ \%$

(b)$7, 10\ \%$

(c)$9, 0.01\ \%$

(d)$7, 0.01\ \%$

A. $5, 1\ \%$

B. $7, 10\ \%$

C. $9, 0.01\ \%$

D. $7, 0.01\ \%$

Answer: B

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76. The percentage degree of hydrolysis of a salt of weak acid (HA) and weak base (BOH) in its 0.1 M solution is found to be 10%. If the molarity of the solution is 0.05 M, the percentage hydrolysis of the salt should be :

A. 5%

B. 10%

C. 20%

D. None of these

Answer: B

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77. What is the hydronium ion concentration of a 0.02 M solution of Cu^{2+} solution of copper(II) perchlorate? The acidity constant of the following reaction is 5×10^{-9}.

$Cu^{2+}(aq.) + 2H_2O(l) \Leftrightarrow Cu(OH)^{+}(aq.) + H_3O^{+}(aq.)$

(a)1×10^{-5}

(b)7×10^{-4}

(c)5×10^{-4}

(d)1×10^{-4}

A. 1×10^{-5}

B. 7×10^{-4}

C. 5×10^{-4}

D. 1×10^{-4}

Answer: A

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78. What is the acidity constant for the following reaction given that the hydronium ion concentration of a 0.04 M solution of Ni^{2+} solution of nickel(II) perchlorate is 4.5×10^{-6}?

$Ni^{2+}(aq.) + 2H_2O(l) \Leftrightarrow Ni(OH)^{+}(aq.) + H_3O^{+}(aq.)$

A. 2×10^{-12}

B. 4×10^{-6}

C. 5×10^{-12}

D. 5×10^{-10}

Answer: D

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79. Calculate the pH at 25°C of a solution that is 0.10 M in $Fe(NO_3)_3$. The acid dissocation constant for the reaction given below is 1.0×10^{-3}.

$$\left[Fe(H_2O)_6\right]^{3+} + H_2O(l) \Leftrightarrow H_3O^+(aq.) + \left[Fe(H_2O)_5(OH)\right]^{2+}$$

A. 2.00

B. 2.02

C. 2.30

D. 2.50

Answer: B

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80. Approximate pH of 0.01 M NaHA is calculated by :

$(K_{a1} = 10^{-6}$ and $K_{a2} = 10^{-8}$ are ionization constants of $H_2A)$

A. $pH = 7 + \frac{pK_{a1}}{2} + \frac{\log C}{2}$

B. $pH = 7 - \frac{pK_{a1}}{2} - \frac{\log C}{2}$

C. $pH = \frac{pK_{a1} + pK_{a2}}{2}$

D. None of these

Answer: C

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81. H_3PO_4 is a weak triprotic acid, approximate pH 0.1 M Na_2HPO_4(aq.)

is calculated by:

A. $\frac{1}{2}[pK_{a1} + pK_{a2}]$

B. $\frac{1}{2}[pK_{a2} + pK_{a3}]$

C. $\frac{1}{2}[pK_{a1} + pK_{a3}]$

D. $pK_{a1} + pK_{a2}$

Answer: B

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82. Which of the following is a buffer solution?

A. 500 mL of 0.1 N CH_3COOH + 500 mL of 0.1 N NaOH

B. 500 mL of 0.1 N CH_3COOH + 500 mL of 0.1 N HCl

C. 500 mL of 0.1 N CH_3COOH + 500 mL of 0.2 N NaOH

D. 500 mL of 0.1 N CH_3COOH+500 mL of 0.1 N $NaOH$

Answer: D

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83. If 20 mL of 0.1 M NaOH is added to 30 mL of 0.2 M CH_3COOH $(pK_a = 4.74)$, the pH of the resulting solution is :

A. 4.44

B. 9.56

C. 8.96

D. 9.26

Answer: A

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84. $H_2CO_3 + NaHCO_3$ 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:

A. HCO_3^-

B. H_2CO_3

C. H^+ ion

D. CO_3^{2-} ion

Answer: A

Watch Video Solution

85. $100mL$ of $0.02M$ benzoic acid $(pK_a = 4.2)$ is titrated using $0.02MNaOH$. pH values after $50mL$ and $100mL$ of $NaOH$ have been added are

A. $3.50, 7$

B. $4.2, 7$

C. $4.2, 8.1$

D. $4.2, 8.25$

Answer: C

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86. What is the pH of a solution of 0.28 M acid and 0.84 M of its conjugate base if the ionization constant of acid is 4×10^{-4}?

A. 3.88

B. 3.34

C. 7

D. 10.12

Answer: A

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87. The toxic compound 2,4-dinitrophenol has $K_a = 10^{-4}$. In an experiment, a buffer solution of 2,4-dinitrophenol was prepared with the pH adjusted to 5. Calculate the ratio of the concentrations of the dissociated ion to the undissociated acid:

A. 0.01

B. 0.1

C. 10

D. 100

Answer: C

Watch Video Solution

88. Equilibrium constant for the following reaction is 1×10^{-9} :

$C_5H_5N(aq.) + H_2O(l) \Leftrightarrow C_5H_5NH^+(aq.) + OH^-(aq.)$

Determine the moles of pyridinium chloride $(C_5H_5N.HCL)$ is added to 500ml of 0.4M of pyridine(C_5H_5N) obtain a buffer solution of pH=5 :

A. 0.1 mole

B. 0.2 mole

C. 0.3 mole

D. 0.4 mole

Answer: B

Watch Video Solution

89. Which one of the following mixture does not act as a buffer solution?

A. Boric acid and borax

B. Sodium phosphate & disodium hydrogen phosphate

C. Sodium propionate and propionic acid

D. Sod. Acetate and sodium propionate

Answer: d

Watch Video Solution

90. The acid dissociation constant of uric acid is $K_a = 4.0 \times 10^{-6}$ M. The pH of a sample of urine is 6.0. What is the ratio of concentration of urate ion to uric acid in the urine?

(a)2.0

(b)4.0

(c)6.0

(d)0.25

A. 2.0

B. 4.0

C. 6.0

D. 0.25

Answer: B

Watch Video Solution

91. CH_3NH_2 (0.12 mole, pK_b=3.3) is added to 0.08 moles of HCl and the solution is diluted to on litre, resulting pH of solution is :

(a)10.7

(b)3.6

(c)10.4

(d)11.3

A. 10.7

B. 3.6

C. 10.4

D. 11.3

Answer: C

Watch Video Solution

92. An aqueous solution at room temperature contains 0.01 M NH_4Cl and 0.1M $NH_4OH(pK_b = 5)$, the pH of the solution is :

a. 7.5

b. 10

c. 6.5

d. 6.8

A. 7.5

B. 6.8

C. 6.5

D. 8.0

Answer: B

Watch Video Solution

93. Which of the following will increase with dilution at a given temperature?

A. pH of 10^{-3} M acetic acid solution

B. pH of 10^{-3} M aniline solution

C. degree of dissociation of 10^{-3} acetic acid

D. degree of dissociation of 10^{-3} M aniline solution

Answer: A,C,D

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94. A 1L solution contains 0.2M NH_4OH and 0.2M NH_4Cl. If 1.0 mL of 0.001 M HCl is added to it what will be the $[OH^-]$ of the resulting solution $(K_b = 2 \times 10^{-5})$

A. 2×10^{-5}

B. 5×10^{-10}

C. 2×10^{-3}

D. None of these

Answer: A

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95. 0.1 M formic acid solution is titrated against 0.1 M NaOH solution. What would be the difference in pH between 1/5 and 4/5 stages of neutralization of acid?

A. 2 log 3/4

B. 2 log 1/5

C. log 1/3

D. 2 log 4

Answer: D

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

A. 3

B. 1

C. 2

D. 4

Answer: A

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97. A buffer solution is made up of acetic acid $[pK_a = 5]$ having conc.=1.5M and sodium acetate having conc.=0.15 M. What is the number OH^- ions present in 1 litre solution?

a. $10^{-10}N_A$

b. $10^{-4}N_A$

c. $10^{-3}N_A$

d. $10^{-6}N_A$

A. $10^{-10}N_A$

B. $10^{-4}N_A$

C. $10^{-3}N_A$

D. $10^{-6}N_A$

Answer: A

Watch Video Solution

98. The pH of a solution of 0.10 M CH_3COOH increases when which of the following substances is added?

A. $NaHSO_4$

B. $HClO_4$

C. KNO_3

D. K_2CO_3

Answer: D

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99. H^+ ion concentration of water does not change by adding:

a.CH_3COONa

b.$NaNO_3$

c.$NaCN$

d. Na_2CO_3

A. CH_3COONa

B. $NaNO_3$

C. $NaCN$

D. Na_2CO_3

Answer: B

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100. pK_a of NH_4^+ is 9.26. Hence, effective range for $NH_4OH - NH_4Cl$ buffer is about pH:

A. 8.26 to 10.26

B. 4.74 to 5.74

C. 3.74 to 5.74

D. 8.26 to 9.26

Answer: A

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101. 1.0 L solution is prepared by mixing 61 g benzoic acid $(pK_a = 4.2)$ with 72 g of sodium benzoate and then 300 mL 1.0 M HBr solution was added. The pH of final solution is :

A. 3.6

B. 3.8

C. 4.2

D. 4.8

Answer: A

Watch Video Solution

102. The pH of a solution containing 0.4 M HCO_3^- and 0.2 M CO_3^{2-} is :

$\left[K_{a1}(H_2CO_3) = 4 \times 10^{-7}, K_{a2}\left(HCO_3^-\right) = 4 \times 10^{-11}\right]$

A. 10.4

B. 10.1

C. 6.1

D. 10.7

Answer: B

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103. The pH of the resultant solution of 20 mL of 0.1 M H_3PO_4 and 20 mL of 0.1 M Na_3PO_4 is :

A. $pK_{a1} + \log 2$

B. pK_{a1}

C. pK_{a2}

D. $\frac{pK_{a1} + pK_{a2}}{2}$

Answer: C

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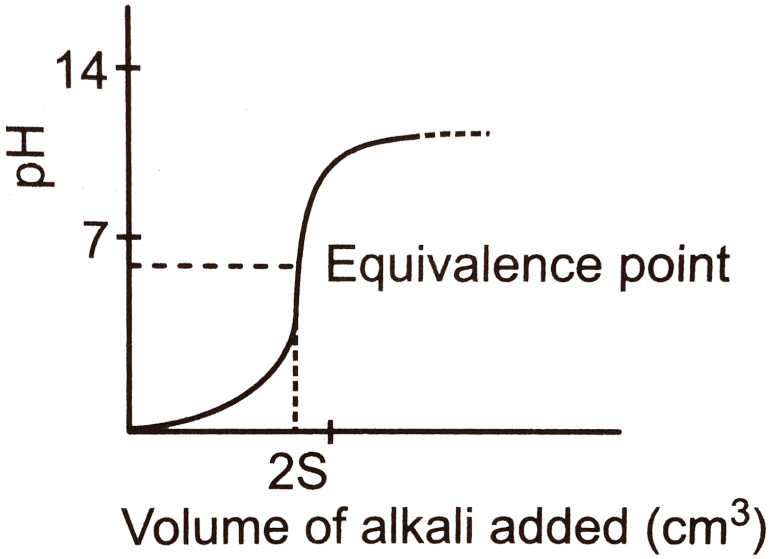

104.

The graph represents the titration curve for :

a.Strong acid and strong base

b.Strong acid and weak base

c.Weak acid and strong base

d.Weak acid and weak base

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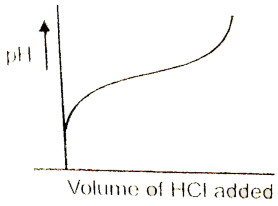
105. When 100 mL of 0.1 M NaCN solution is titrated with 0.1 M HCl solution the variation of pH of solution with volume of HCl added will be :

A.



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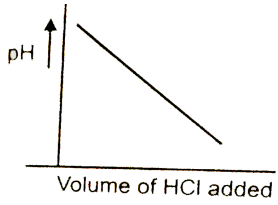
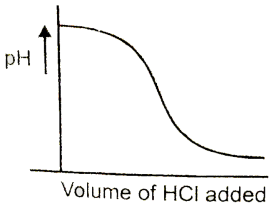
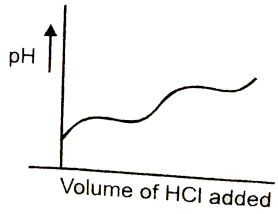


C.



D.



Answer: C

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106. The best indicator for the detection of the end point in the titration of a weak acid and a strong base is

A. Methyl orange (3.1 to 4.4)

B. Methyl red (4.2 to 6.3)

C. Bromothymol blue (6 to 7.6)

D. Phenolphthalein (8.2 to 10)

Answer: D

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107. Select the best indicator from the given table for titration of 20 mL of 0.02 M $CH_3COOH with 0.02 M NaOH$. $Given$pK_(a)(CH_(3)COOH)=4.74{:(,"Indicator","pH range"),((I),"Bromothymol blue",6.0-7.6),((II),"Thymolphthalein",9.3-10.5),((III),"Malachite green",11.4-13),((IV),"M-Cresol purple",7.4-90):}`

A. I

B. II

C. III

D. IV

Answer: D

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108. Bromothymol blue is an indicator with a K_a value of 6×10^{-5}. What $\%$ of this indicator is in its basic form at a pH of 5 ?

A. 40

B. 85.7

C. 14.3

D. 60

Answer: B

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109. An acid-base indicator has a K_a of 3.0×10^{-5}. The acid form of the indicator is red and the basic form is blue. (a) By how much must the pH change in order to change the indicator from $75\ \%$ red to $75\ \%$ blue?

A. 8×10^{-5}M

B. 9×10^{-5}M

C. 1×10^{-5}M

D. 3×10^{-4}M

Answer: A

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110. An acid-base indicator which is a weak acid has a pK_{In} value =5.45. At what concentration ratio of sodium acetate to acctic acid would the indicator show a colour half-way between those of its acid and conjugate

base forms ?

$[pK_a$ of acetic acid =4.75, log 2=0.3]

A. $4:1$

B. $6:1$

C. $5:1$

D. $3:1$

Answer: C

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111. A 20.0 mL sample of a 0.20 M solution of the weak diprotic acid H_2A is titrated with 0.250 M NaOH. The concentration of solution at the second equivalent point is:

A. 0.10 M NaHA

B. $0.153MNa_2A$

C. $0.10MNa_2A$

D. $0.0769MNa_2A$

Answer: D

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112. During the titration of a weak diprotic acid (H_2A) against a strong base $(NaOH)$, the pH of the solution half-way to the first equivalent point and that at the first equivalent point are given respectively by:

A. pK_{a1} and $pK_{a1} + pK_{a2}$

B. $\sqrt{K_{a1}C}$ and $\frac{pK_{a1} + pK_{a2}}{2}$

C. pK_{a1} and $\frac{pK_{a1} + pK_{a2}}{2}$

D. pK_{a1} and pK_{a2}

Answer: C

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113. In which of the following cases is the solution of $AgCl$ unsaturated?

A. $[Ag^+][Cl^-] < K_{sp}$

B. $[Ag^+][Cl^-] > K_{sp}$

C. $[Ag^+][Cl^-] = K_{sp}$

D. $[Ag^+][Cl^-] \leq K_{sp}$

Answer: A

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114. When equal volumes of following solution are mixed, precipitation of $AgCl$?

$(K_{sp} = 1.8 \times 10^{-10})$ will occur only with

A. $10^{-4}M(Ag^+)$ and $10^{-4}M(Cl^-)$

B. $10^{-5}M(Ag^+)$ and $10^{-5}M(Cl^-)$

C. $10^{-5}M(Ag^+)$ and $10^{-6}M(Cl^-)$

D. $10^{-10}M(Ag^{+})$ and $10^{-10}M(Cl^{-})$

Answer: A

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115. Choose the correct set of True/Fasle for following statements:

(i) Silver chloride is more soluble in very concentrated sodium chloride solution than in pure water.

(ii) The pH of a buffer solution does not change on addition of small amount of an acid or a base.

(iii) Addition of NH_4Cl does not affect the pH of a solution of NH_4OH

(iv) Degree of hydrolysis of ammonium acetate does not depend upon the concentration of ammonium acetate solution.

(v) A mixture of acetic acid and sodium acetate can act as buffer solution.

A. TTFTT

B. FTTTF

C. TFTFT

D. FTTTT

Answer: D

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116. A 1 litre solution containing NH_4Cl and NH_4OH has hydroxide ion ion concentration of 10^{-6}) mol//litre. Which of the following hydroxides could be precipitated when the solution is added to 1 litre solution of 0.1 M metal ions?

(I) $Ba(OH)_2\left(K_{sp} = 5 \times 10^{-3}\right)$, (II) $Ni(OH)_2\left(K_{sp} = 1.6 \times 10^{-16}\right)$

(III) $Mn(OH)_2\left(K_{sp} = 2 \times 10^{-13}\right)$, (IV) $Fe(OH)_2\left(K_{sp} = 8 \times 10^{-16}\right)$

A. I,II,IV

B. IV

C. II and IV

D. II,III,IV

Answer: C

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117. 150 mL of 0.0008 M ammonium sulphate is mixed with 50 mL of 0.04 M calcium nitrate. The ionic product of $CaSO_4$ will be : $\left(K_{sp} = 2.4 \times 10^{-5} f \text{ or } CaSO_4\right)$

A. $< K_{sp}$

B. $> K_{sp}$

C. $\approx K_{sp}$

D. None of these

Answer: A

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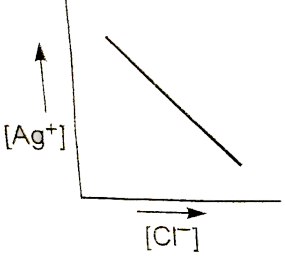
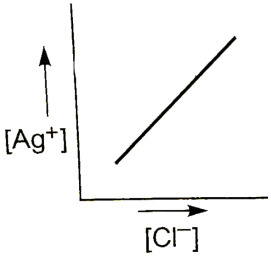
118. In a saturated solution of AgCl, NaCl is added gradually. The concentration of Ag^+ is plotted against the concentration of Cl^-. The graph appears as :

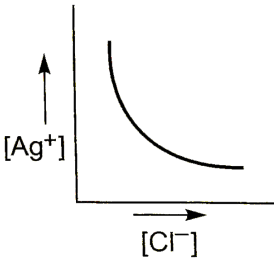
A.



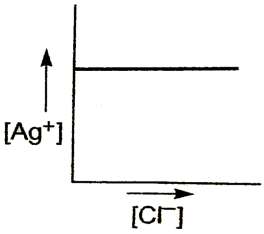
B.



C.



D.



Answer: C

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119. K_{sp} of AgCl is 1×10^{-10}. Its solubility in 0.1 M KNO_3 will be :

A. 10^{-5} moles/litre

B. $> 10^{-5}$ moles/litre

C. $< 10^{-5}$ moles/litre

D. None of these

Answer: A

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120. $50mL$ of a solution containing 10^{-3} mole of Ag^+ is mixed with $50mL$ of a $0.1MHCl$ solution. How much Ag^+ remains in solution ? $(K_{sp}$ of $AgCl = 1.0 \times 10^{-10})$

A. 2.5×10^{-9}

B. 2.5×10^{-7}

C. 2.5×10^{-8}

D. 2.5×10^{-10}

Answer: A

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121. At a certain temperature, the solubility of the salt A_xB_y is S moles per litre. The general expression for the solubility product will be

A. S^2

B. $x^y y^x . S^x + y$

C. $x^x y^y . S^x +^y$

D. $S^x +^y$

Answer: C

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122. What is the molarity of a saturated solution of $CaCO_3$? $\left(K_{sp} = 2.8 \times 10^{-9}\right)$

A. 2.6×10^{-5}

B. 2.8×10^{-9}

C. 5.2×10^{-5}

D. 5.6×10^{-9}

Answer: C

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123. K_{sp} of $Zr_3(PO_4)_4$ in terms of solubility (S) is :

A. $108S^7$

B. $4S^3$

C. $6912S^7$

D. None of these

Answer: C

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124. The solubility of electrolytes MX_1, MX_2 and $MX_3 is 1 \times 10^{-3}$ moles per litre. Hence their respective solubility products are :

A. $10 \times^{-6}, 4 \times 10^{-9}, 27 \times 10^{-12}$

B. $10^{-9}, 4 \times 10^{-9}, 32 \times 10^{-12}$

C. $10^{-9}, 8 \times 10^{-8}, 32 \times 10^{-12}$

D. None of these

Answer: A

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125. A saturated solution of $Ca_3(PO_4)_2$ has $\left[Ca^{2+}\right] = 2 \times 10^{-8}$ M and $\left[PO_4^{3-}\right] = 1.6 \times 10^{-5}$ M K_{sp} of $Ca_3(PO_4)_2$ is :

A. 3.2×10^{-13}

B. 3.2×10^{-34}

C. 2.048×10^{-33}

D. None of these

Answer: C

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126. Which of the following is most soluble in water?

A. $Ba_3(PO_4)_2\left(K_{sp} = 6 \times 10^{-39}\right)$

B. $ZnS\left(K_{sp} = 7 \times 10^{-16}\right)$

C. $Fe(OH)_3\left(K_{sp} = 6 \times 10^{-38}\right)$

D. $Ag_3(PO_4)\left(K_{sp} = 1.8 \times 10^{-18}\right)$

Answer: D

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127. Silver ions are added to a solution with $[Br^-] = [Cl^-] = [CO_3^{2-}] = [AsO_4^{3-}]$=0.1M. Which compound will precipitate with lowest $[Ag^+]$?

A. $AgBr\left(K_{sp} = 5 \times 10^{-13}\right)$

B. $AgCl\left(K_{sp} = 1.8 \times 10^{-10}\right)$

C. $Ag2CO_3\left(K_{sp} = 8.1 \times 10^{-12}\right)$

D. $Ag_3AsO_4\left(K_{sp} = 1 \times 10^{-22}\right)$

Answer: A

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128. The solubility of different springly soluble salts are given as under :

$S.\ No$	Formula Type	Solubility product
(1)	AB	4.0×10^{-20}
(2)	A_2B	3.2×10^{-11}
(3)	AB_3	2.7×10^{-31}

The correct increasing order of solubility is :

A. 1,3,2

B. 2,1,3

C. 1,2,3

D. 3,1,2

Answer: A

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129. If K_{sp} for $HgSO_4$ is 6.4×10^{-5}, then solubility of this substance in mole per m^3 is

A. 8×10^{-3}

B. 6.4×10^{-5}

C. 8×10^{-6}

D. None of these

Answer: A

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130. The solubility of $Ba_3(AsO_4)_2$(formula mass=690) is 6.9×10^{-2} g//100 mL. What is the K_{sp}?

A. 1.08×10^{-11}

B. 1.08×10^{-13}

C. 1.0×10^{-15}

D. 6.0×10^{-13}

Answer: B

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131. The solubility of $AgBrO_3$ (formula mass=236) is 0.0072 g in 1000 mL. What is the K_{sp}?

A. 2.2×10^{-8}

B. 3.0×10^{-10}

C. 3.0×10^{-5}

D. 9.3×10^{-10}

Answer: D

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132. The solubility of PbF_2 (formula mass =245) is 0.46 g/L. What is the solubility product?

A. 1.1×10^{-10}

B. 2.6×10^{-8}

C. 1.1×10^{-7}

D. 6.8×10^{9}

Answer: B

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133. How many grams of MgC_2O_4 (formula mass =112) will dissolve in 1.5 L of water?

$\left(K_{sp} = 8.1 \times 10^{-5}\right)$

A. 1.0

B. 1.29

C. 1.512

D. 4.65

Answer: C

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134. What is the molarity of F^- ions in a saturated solution of BaF_2?

$\left(K_{sp} = 1.0 \times 10^{-6}\right)$

A. 1.0×10^{-2}

B. 1.0×10^{-3}

C. 1.26×10^{-2}

D. 6.3×10^{-3}

Answer: D

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135. What is the molarity of F^- in a saturated solution of In F_3? $\left(K_{sp} = 7.9 \times 10^{-10}\right.$

A. 2.3×10^{-3}

B. 8.3×10^{-3}

C. 1.0×10^{-3}

D. 7.0×10^{-3}

Answer: C

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136. What is the pH of a saturated solution of $Cu(OH)_2$? $\left(K_{sp} = 2.6 \times 10^{-19}\right.$

A. 6.1

B. 7.30

C. 8.42

D. 7.90

Answer: D

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137. The solubility product of $AgCl$ is $10^{-10}M^2$. The minimum volume (in $m^3\Big)$ of water required to dissolve $14.35mg$ of $AgCl$ is approximately :

A. 0.01

B. 0.1

C. 100

D. 10

Answer: A

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138. What is the molar solubility of $Fe(O)_2$ (K_(sp)=8.0xx10^(-16))$atpH$ 13.0`?

A. 8.0×10^{-18}

B. 8.0×10^{-15}

C. `8.0xx10^(-17)

D. 8.0×10^{-14}

Answer: D

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139. What is the minimum pH necessary to cause a precipitate of $Pb(OH)_2$ $\left(K_{sp} = 1.2 \times 10^{-5}\right)$ to form in a 0.12 M $PbCl_2$ solution?

A. 12.4

B. 10.8

C. 12.0

D. 11.1

Answer: C

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140. Which of the following would increase the solubility of $Pb(OH)_2$?

A. Add hydrochloric acid

B. Add a solution of $Pb(NO_3)_2$

C. Add a solution of NaOH

D. None of the above-the solubility a compound is constant a constant temperature

Answer: A

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141. What is the molar solubility of $Ag_2CO_3\left(K_{sp}=4\times10^{-13}\right)$ in $0.1MNa_2CO_3$ solution ?

A. 10^{-6}

B. 10^{-7}

C. 2×10^{-6}

D. 2×10^{-7}

Answer: A

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142. What is the concentration of Pb^{2+} when $PbSO_4$ $\left(K_{sp} = 1.8 \times 10^{-8}\right)$ begins to precipitate from a solution that is 0.0045 M in SO_4^{2-}?

A. 4.0×10^{-8} M

B. 1.0×10^{-6} M

C. 2.0×10^{-8} M

D. 4.0×10^{-6} M

Answer: D

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143. What is the concentration of Ba^{2+} when BaF_2 $\left(K_{sp} = 1.0 \times 10^{-6}\right)$ begins to precipitate from a solution that is 0.30 M F^- ?

A. 9.0×10^{-7}

B. 3.3×10^{-5}

C. 1.1×10^{-5}

D. 3.0×10^{-5}

Answer: C

Watch Video Solution

144. Solubility of AgCl in 0.2 M NaCl is x and that in 0.1 M $AgNO_3$ is y. Then which of the following is correct?

A. $x = y$

B. $x > y$

C. xlty`

D. We cannot predict

Answer: C

Watch Video Solution

145. What is the molarity of $Fe(CN)_6^{4-}$ in a saturated solution of $Ag_4[Fe(CN)_6]$?

$(K_{sp} = 1.6 \times 10^{-41})$

A. 1.6×10^{-8}

B. 5.2×10^{-8}

C. 2.0×10^{-8}

D. 2.3×10^{-9}

Answer: D

Watch Video Solution

146. At 25°C, K_{sp} for $PbBr_2$ is equal to 8×10^{-5}. If the salt is 80% dissociated, What is the solubility of $PbBr_2$ in mol//litre?

A. $\left[\frac{10^{-4}}{1.6 \times 1.6}\right]^{1/2}$

B. $\left[\frac{10^{-4}}{1.6 \times 1.6}\right]^{1/3}$

C. $\left[\frac{10^{-4}}{0.8 \times 0.8}\right]^{1/3}$

D. $\left[\frac{10^{-5}}{1.6 \times 1.6}\right]^{1/2}$

Answer: B

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147. What is the molar solubility of $Mn(OH)_2\left(K_{sp} = 4.5 \times 10^{-14}\right)$ in a buffer solution containing equal amounts of NH_4^+ and NH_3 $\left(K_b = 1.8 \times 10^{-5}\right)$?

A. 3.0×10^{-4}

B. 1.38×10^{-4}

C. 1.38×10^{-3}

D. 7.3×10^{-4}

Answer: B

Watch Video Solution

148. Find moles of NH_4Cl required to prevent $Mg(OH)_2$ from precipitating in a litre of solution which contains 0.02 mole NH_3 and 0.001 mole Mg^{2+} ions.

Given : $K_b(NH_3) = 10^{-5}$, $K_{sp}\left[Mg(OH)_2\right] = 10^{-11}$.

A. 10^{-4}

B. 2×10^{-3}

C. 0.02

D. 0.1

Answer: B

Watch Video Solution

149. What mass of AgI will dissolve in 1.0 L of 1.0 M NH_3? Neglect change in conc. Of NH_3.

[Given: $K_{sp}(AgI) = 1.5 \times 10^{-16}$), $K_f\left[Ag(NH_3)_2^+\right] = 1.6 \times 10^7$], (At. Mass Ag=108,I=127)

A. 4.9×10^{-5} g

B. 0.0056 g

C. 0.035 g

D. 0.011 g

Answer: D

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150. Consider the following statement and select correct option:

(I) K_{sp} of $Fe(OH)_3$ in aqueous solution is 3.8×10^{-38} at 298 K. The concentration of Fe^+ will increase when $\left[H^+\right]$ ion concentration decreases.

(II) In a mixture of NH_4Cl and NH_4OH in water, a further amountof NH_4Cl is added. The pH of the mixture will decreases.

(III) An aqueous solution of each of the following salt $(NH_4I, HCOOK)$ will be basic, acidic respectively.

A. only I is correct

B. only II is correct

C. only III is correct

D. II and III are correct

Answer: B

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Level 2

1. Equilibrium constants of T_2O $\left(T \text{ or } {}_1^3H \text{ is an isotope } of {}_1^1H\right)$ and H_2O are different at 298 K. Let at 298 K pure T_2O has pT (like pH) is 7.62. The pT of a solution prepared by adding 10 mL. of 0.2 M TCl to 15 mL of 0.25 M NaOT is:

A. $2 - \log 7$

B. $14 + \log 7$

C. $13.24 - \log 7$

D. $13.24 + \log 7$

Answer: D

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2. Liquid NH_3 dissociation to a slight extent, At a certain temp. its self dissociation constant $K_{SDC(NH_3)}$ =10^{-30}. The number of NH_4^+ ions are present per $100cm^3$ of pure liquid are :

A. 10^{-15}

B. 6.022×10^8

C. 6.022×10^7

D. 6.022×10^6

Answer: C

Watch Video Solution

3. To what volume of 10 litre of 0.5 M CH_3COOH $\left(K_a = 1.8 \times 10^{-5}\right)$ be diluted in order to double the hydroxide ion concentration :

(a) 20L

(b) 30L

(c) 40L

(d) None of these

A. 20 L

B. 30 L

C. 40 L

D. None of these

Answer: C

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4. 20 mL of 0.1 M weak acid $HA\left(K_a = 10^{-5}\right)$ is mixed with solution of 10 mL of 0.3 M HCl and 10 mL. of 0.1 M NaOH. Find the value of $\left[A^-\right]$//([HA]+ [A^(-)])` in the resulting solution :

A. 2×10^{-4}

B. 2×10^{-5}

C. 2×10^{-3}

D. 0.05

Answer: A

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5. What concentration of FCH_2COOH $\left(K_a = 2.6 \times 10^{-3}\right)$ is needed so that $\left[H^+\right] = 2 \times 10^{-3}$?

A. 2×10^{-3} M

B. 2.6×10^{-3} M

C. 5.2×10^{-3} M

D. 3.53×10^{-3} M

Answer: D

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6. Calculate the ratio of $\left[HXOO^{-}\right]$ and $\left[F^{-}\right]$ in a mixture of 0.2 M HCOOH $\left(K_a = 2 \times 10^{-4}\right)$ and 0.1 M HF $\left(K_a = 6.6 \times 10^{-4}\right)$:

(a)$1:6.6$

(b)$1:3.3$

(c)$2:3.3$

(d)$3.3:2$

A. $1:6.6$

B. $1:3.3$

C. $2:3.3$

D. $3.3:2$

Answer: C

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7. If first dissociation of $X(OH)_3$ is $100\,\%$ where as second dissociation is $50\,\%$ and third dissociation is negligible then the pH $4 \times 10^{-3} MX(OH)_3$ is :

A. 11.78

B. 10.78

C. 2.5

D. 2.22

Answer: A

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8. H_3A is a weak triprotic acid $\left(K_{a1} = 10^{-5}, K_{a2} = 10^{-9}, K_{a3} = 10^{-13}\right.$

What is the value of pX of 0.1 M H_3A (aq.) solution ? Where pX=-log X and X=$\frac{[A^{3-}]}{[HA^{2-}]}$

A. 7

B. 8

C. 9

D. 10

Answer: D

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9. Calcium lactate is a salt of weak organic acid and strong base represented as $Ca(LaC)_2$. A saturated solution of $Ca(LaC)_2$ contains 0.6 mole in 2 litre solution. pOH of solution is 5.60. If $90\ \%$ dissociation of the salt takes place then what is pK_a of lactic acid?

A. $2.8 - \log(0.54)$

B. $2.8 + \log(0.54)$

C. $2.8 + \log(0.27)$

D. None the these

Answer: A

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10. What is the concentration of $CH_3COOH(aq.)$ in a solution prepared by dissolving 0.01 mole of $NH_4^+CH_3COO^-$ in 1 L H_2O? $[K_a(CH_3COOH)) = 1.8 \times 10^{-5}), K_b(NH_4OH) = 1.8 \times 10^{-5})]$

A. 5.55×10^{-5}

B. 0.10

C. 6.4×10^{-4}

D. 5.55×10^{-3}

Answer: A

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11. K_a for the reaction,

$Fe^{3+}(aq) + H_2O(l) \Leftrightarrow Fe(OH)^{2+}(aq) + H_3O^{\oplus}(aq)$ is 6.5×10^{-3}, what is the maximum pH value which could be used so that at least $80\,\%$ of the total iron (III) in a dilute solution exsists as Fe^{3+}?

A. 2

B. 2.41

C. 2.79

D. 1.60

Answer: D

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12. $Fe(OH)_2$ is diacidic base has $K_{b1} = 10^{-4}$ and $K_{b2} = 2.5 \times 10^{-6}$ What is the concentration of $Fe(OH)_2$ in 0.1 M $Fe(NO_3)_2$ solution?

A. 4×10^{-9}

B. 2.5×10^{-6}

C. 10^{-10}

D. 10^{-14}

Answer: C

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13. How many gm of solid KOH must be added to 100 mL of a buffer solution to make the pH of solution 6.0, if it is 0.1 M each w.r.t. acid HA and salt K A.

$[Given: pK_a(HA) = 5]$

A. 0.458

B. 0.327

C. 5.19

D. None of these

Answer: A

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14. Fixed volume of 0.1 M benzoic acid $(pK_a = 4.2)$ solution is added into 0.2 M sodium benzoate solution and formed a 300 mL, resultant acidic buffer solution. If pH of this buffer solution is 4.5 then find added volume of benzoic acid :

A. 100 mL

B. 150 mL

C. 200 mL

D. None of these

Answer: B

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15. A 1.025 g sample containing a weak acid HX (mol. Mass=82) is dissolved in 60 mL. water and titrated with 0.25 M NaOH. When half of the acid was neutralised the pH was found to be 5.0 and at the equivalence point the pH is 9.0. Calculate mass precentage of HX in sample :

a.50 %

b.75 %

c.80 %

d.None

A. 50 %

B. 75 %

C. 80 %

D. None of these

Answer: C

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16. Which of the following expression for $\%$ dissociation of a monoacidic base (BOH) in aqueous solution at appreciable concentration is not correct?

(a) $100 \times \sqrt{\frac{K_b}{c}}$

(b) $\frac{1}{1+10^{(pK_b - pOH)}}$

(c) $\frac{K_w[H^+]}{K_b + K_w}$

(d) $\frac{K_b}{K_b + [OH^-]}$

A. $100 \times \sqrt{\frac{K_b}{c}}$

B. $\frac{1}{1+10^{(pK_b - pOH)}}$

C. $\frac{K_w[H^+]}{K_b + K_w}$

D. $\frac{K_b}{K_b + [OH^-]}$

Answer: C

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17. A solution of weak acid HA was titrated with base NaOH. The equivalent point was reached when 40 mL. Of 0.1 M NaOH has been added. Now 20 mL of 0.1 M HCl were added to titrated solution, the pH was found to be 5.0 What will be the pH of the solution obtained by mixing 20 mL of 0.2 M NaOH and 20 mL of 0.2 M HA?

A. 7

B. 9

C. 11

D. None of these

Answer: B

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18. A buffer solution 0.04 M in Na_2HPO_4 and 0.02 in Na_3PO_4 is prepared. The electrolytic oxidation of 1.0 milli-mole of the organic compound RNHOH is carried out in 100 mL of the buffer. The reaction is

$RNHOH + H_2O \rightarrow RNO_2 + 4H^+ + 4e^-$ The approximate pH of solution after the oxidation is complete is :

$[Given: f \text{ or } H_3PO_4, pK_{a1} = 2.2, pK_{a2} = 7.20, pK_{a3} = 12]$

(a)6.90

(b)7.20

(c)7.5

(d)None of these

A. 6.90

B. 7.20

C. 7.5

D. None of these

Answer: C

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19. When a 20 mL of 0.08 M weak base BOH is titrated with 0.08 M HCl, the pH of the solution at the end point is 5. What will be the pOH if 10 mL of

0.04 M NaOH is added to the resulting solution?

$[Given: \log 2 = 0.30 \text{ and } \log 3 = 0.48]$

A. 5.40

B. 5.88

C. 4.92

D. None of these

Answer: B

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20. Calculate approximate pH of the resultant solution formed by titration of 25 mL of 0.04 M Na_2CO_3 with 50 mL of 0.025 M HCl. $[Given: pK_{a1} = 6.4 \text{ and } pK_{a2} = 10.3f \text{ or } H_2CO_3]$

A. 5.92

B. 6.88

C. 6.4

D. 5.88

Answer: B

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21. In the titration of solution of a weak acid HA and NaOH, the pH is 5.0 after 10 mL of NaOH solution has been added and 5.60 after 20 mL NaOH has been added.

What is the value of pK_a for HA?

A. 5.15

B. 5.3

C. 5.6

D. None of these

Answer: B

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22. 50 mL of 0.05 M Na_2CO_3 is titrated against 0.1 M HCl. On adding 40 mL of HCl, pH of the solution will be $[Given: F$ or $H_2CO_3, pK_{a1} = 6.35, pK_{a2} = 10.33, \log 3 = 0.477, \log 2 = 0$

A. 6.35

B. 6.526

C. 8.34

D. 6.173

Answer: D

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23. 10 mL of 0.1 M tribasic acid H_3A is titrated with 0.1 M NaOH solution. What is the ratio of $\frac{[H_3A]}{[A^{3-}]}$ at 2^{nd} equivalence points? $[Given: K_{a1} = 10^{-3}, K_{a2} = 10^{-8}, K_{a3} = 10^{-12}]$

(a) $\cong 10^{-4}$

(b) $\cong 10^{+4}$

(c) $\cong 10^{-7}$

(d) $\cong 10^{+6}$

A. $\cong 10^{-4}$

B. $\cong 10^{+4}$

C. $\cong 10^{-7}$

D. $\cong 10^{+6}$

Answer: C

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24. A_3B_2 is a sparingly soluble salt with molar mass $M\left(gmol^{-1}\right)$ and solubility x gm $litre^{-1}$, the ratio of the molar concentration of B^{3-} to the solubilty product of the salt is : —

A. $108\frac{x^5}{m^5}$

B. $\frac{1}{108}\frac{M^4}{x^4}$

C. $\frac{1}{54}\frac{M^4}{x^4}$

D. None of these

Answer: C

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25. A solution is 0.10 M $Ba(NO_3)_2$ and 0.10 M $Sr(NO_3)_2$. If solid Na_2CrO_4 is added to the solution, what is $\left[Ba^{2+}\right]$ when $SrCrO_4$ begins to precipitate?

$\left[K_{sp}(BaCrO_4) = 1.2 \times 10^{-10}, K_{sp}(SrCrO_4) = 3.5 \times 10^{-5}\right]$

A. 7.4×10^{-7}

B. 2.0×10^{-7}

C. 6.1×10^{-7}

D. 3.4×10^{-7}

Answer: D

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26. A solution is 0.01 M KI and 0.1 M KCl. If solid $AgNO_3$ is added to the solution, what is the $\left[I^-\right]$ when AgCl begins to precipitate?

$\left[K_{SP}(AgI) = 1.5 \times 10^{-16}, K_{SP}(AgCl) = 1.8 \times 10^{-10}\right]$

A. 3.5×10^{-7}

B. 6.1×10^{-8}

C. 2.2×10^{-7}

D. 8.3×10^{-8}

Answer: D

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27. A solution of 0.1 M in Cl^- and 10^{-4} M CrO_4^{-2}. If solid $AgNO_3$ is gradually added to this solution, what will be the concentration of Cl^- when Ag_2CrO_4 begins to precipitate?

$\left[K_{sp}(AgCl) = 10^{-10}M^2, K_{sp}(Ag_2CrO_4) = 10^{-12}M^3\right]$

A. 10^{-6} M

B. 10^{-4} M

C. 10^{-5} M

D. 10^{-9} M

Answer: A

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28. If 500 mL of 0.4 M $AgNO_3$ is mixed with 500 mL of 2 M NH_3 solution then what is the concentration of $Ag(NH_3)^+$ in solution?

Given : $K_{f1}[Ag(NH_3)]^+ = 10^3$, $K_{f2}\left[Ag(NH_3)_2^+\right] = 10^4$

A. 3.33×10^{-7} M

B. 3.33×10^{-5} M

C. 3×10^{-4} M

D. 10^{-7} M

Answer: B

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29. The simultaneous solubility of $AgCN\left(K_{sp}=2.5\times10^{-16}\right)$ and $AgCl\left(K_{sp}=1.6\times10^{-10}\right)$ in 1.0 M $NH_3(aq.)$ are respectively: $\left[Given: K_{f1}\left[Ag(NH_3)_2^+=10^7\right.\right.$

A. $0.037, 5.78\times10^{-8}$

B. $5.78\times10^{-8}, 0.037$

C. $0.04, 6.25\times10^{-8}$

D. $1.58\times10^{-3}, 1.26\times10^{-5}$

Answer: B

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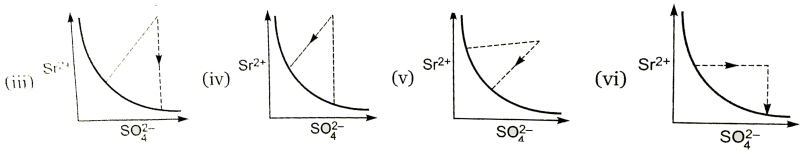
30. There exist an equilibrium between solid $SrSO_4$ and Sr^{2+} and SO_4^{2-} ion in aqueous medium. The possible equilibrium states are shown in figure as thick line. Now, if equlibrium is disturbed by addition of (a) $Sr(NO_3)_2$ and (b) K_2SO_4 and dotted line represent approch of system towards equilibrium. Match the column given below :



(I) addition of $Sr(NO_3)_2$

(II) addition of K_2SO_4

A. (I) (iii), (II) (iv)

B. (I) (iv), (II) (v)

C. (I) (vi),(II) (v)

D. (I) (iv), (II) (vi)

Answer: C

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31. Solubility of AgCN is maximum in :

A. acidic buffer solution

B. basic buffer solution

C. in pure water

D. equal in all solution

Answer: A

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32. AgBr (s) + $2S_2O_3^2(aq.) \Leftrightarrow Ag(S_2O_3)_2^{3-}(aq.) + Br^-(aq)$

$[\text{Using: } K_{sp}(AgBr) = 5 \times 10^{-13} \quad K_f\left(Ag(S_2O_3)_2^{3-}\right) = 5 \times 10^{13}]$

What is the molar solubility of AgBr in 0.1 M Na_2SO_3 ?

A. 0.5 M

B. 0.45 M

C. 0.045 M

D. None of these

Answer: C

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33. What is $\left[Ag^{+}\right]$ in a solution made by dissolving both Ag_2CrO_4 and $Ag_2C_2O_4$ until saturation is reached with respect to both salts ?

$[K_{sp}(Ag_2C_2O_4) = 2 \times 10^{-11}, \quad K_{sp}(Ag_2CrO_4) = 2 \times 10^{-12}]$

A. 2.80×10^{-4}

B. 7.6×10^{-5}

C. 6.63×10^{-6}

D. 3.52×10^{-4}

Answer: D

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34. What is the minimum pH required to prevent the precipitation of ZnS in a solution that is 0.01 M $ZnCl_2$ and saturated with 0.10 M H_2S ?

$[\text{Given: } K_{sp} = 10^{-21}, K_{a_1} \times K_{a_2} = 10^{-20}]$

A. 0

B. 1

C. 2

D. 4

Answer: B

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35. The Al $(OH)_3$ is involved in the following two equilibria,

$Al(OH)_3(s) \Leftrightarrow Al^{3+}(aq) + 3OH^-(aq), K_{sp}$

$Al(OH)_3(s) + OH^-(aq.) \Leftrightarrow Al(OH)_4^-(aq), K_c$

Which of the following relationship is correct at which solubility is minimum?

A. $[OH^-] = \left(\frac{K_{sp}}{K_c}\right)^{1/3}$

B. $[OH^-] = \left(\frac{K_c}{K_{sp}}\right)^{1/4}$

C. $[OH^-] = \sqrt{\left(\frac{K_{sp}}{K_c}\right)^{1/4}}$

D. None of these

Answer: D

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Level 3

1. one litre of an aqueous solution contains 0.15 mole of $CH_3COOH(pK_{a=4.8})$ and 0.15 mole of CH_3 COONa. After the addition of 0.05 mole of solid NaOH to this solution, the pH will be :

A. 4.5

B. 4.8

C. 5.1

D. 5.4

Answer: C

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2. Calculate the pH of a solution made by adding 0.01 mole of HCl in 100 mL of a solution which is 0.2 M in $NH_3(pK_b = 4.74)$ and 0.3 M in NH_4^+ : (Assuming no change in volume)

A. 5.34

B. 8.66

C. 7.46

D. None of these

Answer: B

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3. Useful buffer range of weak acid $HA\left(K_a = 10^{-5}\right)$ is :

A. 5 to 7

B. 4 to 6

C. 3 to 6

D. None of these

Answer: B

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4. Solution of a weak acid and its anion (that is,its conjugate base) or of a base and its common cation are buffered. When we add a small amount of acid or base to any one of the, the pH of solution change very little. pH of buffer solution can be computed as for acidic buffer : $pH = pK_a + \log. \frac{[\text{Conjugate base}]}{[\text{Acid}]}$

for basic buffer : $pOH = pK_b + \log. \frac{[\text{Conjugate acid}]}{[Base]}$

It is generly accepted that a has useful buffer cpacity (pH change

resisting power) provided that the value of [salt or conjugate base] /[acid] for acidic buffer lies within the range of 1 : 10 to 1. Buffer capacity is maximum when [conjugate base] = [acid]

Useful correct statement :

A. When we add small amount of NaOH in acidic buffer aolution, pHO of solution is increases

B. When we add small amount of NaOH in vasic buffer solution, pH of solution is increases

C. When we add small amount of water in acidic buffer solution , pH of solution is decreases

D. When 100 mL of 0.2 M CH_3 COOH react with 200 mL of 0.1 M NaOH buffer solution is

Answer: A

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5. Hydrolysis is an acid-basedreaction of a cation or anion or both ions of a salt with water, Resultan solution of hydrolysis may be acidic, basic or netural. The anion A^- which is a weakeer base than OH^- and which his its conjugate acid HA stronger then water but weaker than H_3O shown the phenomenon of hydrolysis Ex : CH_3COO^-, CN^-, NO_2^- etc.

The contion B^+ which is a weaker acid than H_3^+ which is a weaker acid then H_3^+ and which has its conjugate base BOH stronger than water but weak than OH^- shown the phenmenon of hydrolysis Ex : $NH_4^+ C_6H_5NH^+$, $N_2H_5^+$ etc.

The hydrolysis constant of anion and cation are given by

$$A^-(aq.) + H_2O(l) \Leftrightarrow HA(aq.) + OH^-(aq)$$

$$K_h = \frac{K_w}{K_a} \Rightarrow \frac{[HA(aq.)][OH^-(aq.)]}{[A^-(aq.)]}$$

$$B^+(aq.) + H_2O(l) \Leftrightarrow BOH(aq.) + H^+(aq.)$$

$$K_h = \frac{K_w}{K_b} \Rightarrow \frac{[BOH(aq.)][H^+(aq.)]}{[B^-(aq.)]}$$

Which of the following statement is true

A. Weaker the acid, greater statement is true?

B. Weaker the base, greater will be hydrolysis of its anion

C. Both (a) and (b)

D. None of these

Answer: D

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6. Hydrolysis is an acid-basedreaction of a cation or anion or both ions of a salt with water, Resultan solution of hydrolysis may be acidic, basic or netural. The anion A^- which is a weakeer base than OH^- and which his its conjugate acid HA stronger then water but weaker than H_3O shown the phenomenon of hydrolysis Ex : CH_3COO^-, CN^-, NO_2^- etc.

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$$K_h = \frac{K_w}{K_a} \Rightarrow \frac{[HA(aq.)][OH^-(aq.)]}{[A^-(aq.)]}$$

$$B^+(aq.) + H_2O(l) \Leftrightarrow BOH(aq.) + H^+(aq.)$$

$$K_h = \frac{K_w}{K_b} \Rightarrow \frac{[BOH(aq.)][H^+(aq.)]}{[B^-(aq.)]}$$

select the correct statement :

A. KCl undrgoes hydrolysis

B. $K_h = K_b(A^-)$ and $K_h = K_a(B^+)$

C. 0.1 M solution of NACN is acidic

D. resultant solution of equal volume of 0.1 M NH_3 and 0.1M HCl is basic

Answer: B

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The contion B^+ which is a weaker acid than H_3^+ which is a weaker acid then H_3^+ and which has its conjugate base BOH stronger than water but weak than OH^- shown the phenmenon of hydrolysis Ex : $NH_4^+ C_6H_5NH^+$, $N_2H_5^+$ etc.

The hydrolysis constant of anion and cation are given by

$$A^-(aq.) + H_2O(l) \Leftrightarrow HA(aq.) + OH^-(aq)$$

$$K_h = \frac{K_w}{K_a} \Rightarrow \frac{[HA(aq.)][OH^-(aq.)]}{[A^-(aq.)]}$$

$$B^+(aq.) + H_2O(l) \Leftrightarrow BOH(aq.) + H^+(aq.)$$

$$K_h = \frac{K_w}{K_b} \Rightarrow \frac{[BOH(aq.)][H^+(aq.)]}{[B^-(aq.)]}$$

When pure ammonium chloride is dissolved in pure water, the pH of the resulting not 7. This is because :

A. Ammonium ions accept protons from water molecules leaving fee OH^- ions in solution

B. ammonium ions donate protons to water molecules froming H_3^+ ions in solution

C. Ammonium ions combine with water molecule to give the weak base, ammonium hydroxide

D. chloride ion made the solution acidic

Answer: C

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8. Hydrolysis is an acid-basedreaction of a cation or anion or both ions of a salt with water, Resultan solution of hydrolysis may be acidic, basic or netural. The anion A^- which is a weakeer base than OH^- and which his its conjugate acid HA stronger then water but weaker than H_3O shown the phenomenon of hydrolysis Ex : CH_3COO^-, CN^-, NO_2^- etc.

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The hydrolysis constant of anion and cation are given by

$$A^-(aq.) + H_2O(l) \Leftrightarrow HA(aq.) + OH^-(aq)$$

$$K_h = \frac{K_w}{K_a} \Rightarrow \frac{[HA(aq.)][OH^-(aq.)]}{[A^-(aq.)]}$$

$$B^+(aq.) + H_2O(l) \Leftrightarrow BOH(aq.) + H^+(aq.)$$

$$K_h = \frac{K_w}{K_b} \Rightarrow \frac{[BOH(aq.)][H^+(aq.)]}{[B^-(aq.)]}$$

Calculate percentage degreeof hydrolysis in a 0.1 M solution of $CH_3COONa.\ (K_a \text{of} CH_3COOH = 10^{-5})$

A. 0.1

B. 0.01

C. 10^{-4}

D. None of these

Answer: C

Watch Video Solution

9. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion

concentration reaches a particular calur For example. Phenolphthalein is a coloureless stbstance in any aqueous solution with a pH less than 8.3 In between the pH range 8.3 to 10, transition of colour (colourless to pink) takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

$$\underset{\text{acidic from}}{HIn} \Leftrightarrow H^+ \underset{\text{basic from}}{In^-}$$

pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$.

An indicator is a weak acid and pH range is 4.0 to 6.0. If indicator in 50% ionized in a given solution then what is the inization constant of the acid ?

A. 10^{-4}

B. 10^{-5}

C. 10^{-6}

D. None of these

Answer: B

Watch Video Solution

10. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion concentration reaches a particular calur For example. Phenolphthalein is a coloureless stbstance in any aqueous solution with a pH less than 8.3 In between the pH range 8.3 to 10, transition of colour (colourless to pink) takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

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pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$.

Select the correct statement (s) :

A. At midway in the transition of an acidic indicator, $pH = pK_{\text{in}}$

B. Methyl orange (3.1 to 4.4) is a suitable indicator for titration of weak acid and strong base

C. Bromothymol blue (6.0 to 7.6) is a good indicator for tatration of HCl and NaOH

D. Thymol blue (1.2 "to" 2.8) is a very good indicator for titration of 100 ML of 0.1 M NH_4OH (pK_b = 4.74) and 0.1 M HCl

Answer: A,C

Watch Video Solution

11. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion concentration reaches a particular calur For example. Phenolphthalein is a coloureless stbstance in any aqueous solution with a pH less than 8.3 In between the pH range 8.3 to 10, transition of colour (colourless to pink)

takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

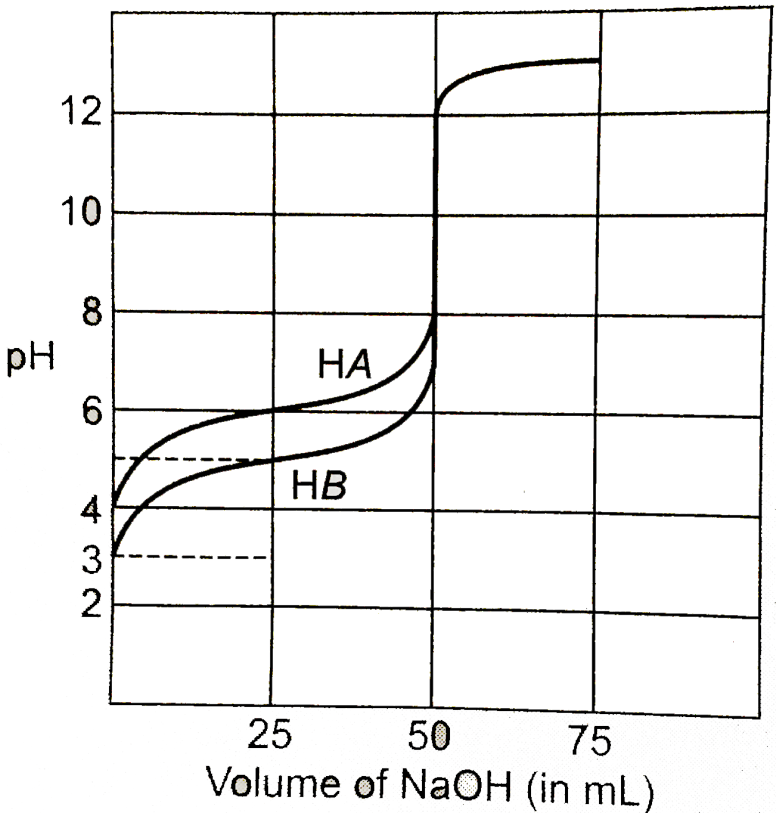
$$\underset{\text{acidic from}}{HIn} \Leftrightarrow H^+ \underset{\text{basic from}}{In^-}$$

pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$.

Following is the titration curce of two acid HA and HB (5 milli-moles each) titrated against strong base NaOH(0.1M)



What is pK_a for HB acid ?

A. 3

B. 4

C. 5

D. 6

Answer: C

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12. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion concentration reaches a particular calur For example. Phenolphthalein is a coloureless stbstance in any aqueous solution with a pH less than 8.3 In between the pH range 8.3 to 10, transition of colour (colourless to pink) takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

$$\underset{\text{acidic from}}{HIn} \Leftrightarrow H^+ \underset{\text{basic from}}{In^-}$$

pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$.

What is equilibrium constant for the reaction :

$HB(aq.) + NaA(aq.) \Leftrightarrow HA(aq.) + NaB(aq.)$?

A. 10

B. 0.1

C. 10^{-7}

D. None of these

Answer: A

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13. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion concentration reaches a particular calur For example. Phenolphthalein is a coloureless stbstance in any aqueous solution with a pH less than 8.3 In between the pH range 8.3 to 10, transition of colour (colourless to pink) takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

$$\underset{\text{acidic from}}{HIn} \Leftrightarrow H^+ \underset{\text{basic from}}{In^-}$$

pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$.

Calculate the pH at equivalence point when 5 milli mol of HB is titrated with 0.1 M NaOH.

A. 8.75

B. 8.85

C. 9.0

D. None of these

Answer: B

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14. Acid-base indicators are either weak organic acids or weak organic bases. Indicator change colour in dilute solution when the hydonium ion concentration reaches a particular colour For example. Phenolphthalein is a coloureless substance in any aqueous solution with a pH less than 8.3 In

between the pH range 8.3 to 10, transition of colour (colourless to pink) takes place and if pH of solution is greater than 10 solution is dark pink. Considering an acid indicator Hln, the equilibrium involving it and its conjgate base In^- can be represented as :

$$\underset{\text{acidic from}}{HIn} \Leftrightarrow H^+ \underset{\text{basic from}}{In^-}$$

pH of solution can be computed as :

$$pH = pK_{In} + \log. \frac{[IN^-]}{[HIn]}$$

In general, transition of colour takes place in between the pH range $pK_{In \pm 1}$

Which of the following indicator is most suitable for titration of HB with strong base :

A. Phenolphthalein (8.3-10)

B. Bromothhmol blue (6-7.6)

C. Methyl red (4.2-6.3)

D. Malachite green (11.4-13)

Answer: A

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15. Consider a sturated solution of silver chloride that is in contact with solid silver chloride. The solubility equilibrium can be represented as

$AgCl(s) \Leftrightarrow Ag^{+}(aq.) + Cl^{-}(aq.), \qquad K_{sp} = \left[Ag^{+}(aq.)\right]\left[Cl^{-}(aq.)\right]$

Where K_{sp} is clled the solubility product constant or simply the solubility product. In general, the solubility product of a compound is the product of the molar concentrations of the constituent ions, each raised to the power of its stoichiometric coefficient in the equilibrium equation.

For concentrations of ions that do not necessarliy correpond to equilibrium conditions we use the reaction quotient (Q) which is clled the ion or ionic prodect (Q) to predict whether a precipitate will from. Note that (Q) has the same for as K_{sp} are

$Q < K_{sp}$ Unsaturated solution

$Q = K_{sp}$ Saturated solution

$Q >_{sp}$ Supersaturated solution, precipitate will from

Will a precipitate from if 50 cm^3 of 0.01 M $AgNO_3$ and 50 cm^3 of 2×10^{-5} M NaCl are mixed?

$\left[\text{Given: } K_{sp}(AgCl) = 10^{-10} M^2\right]$

A. Yes

B. No

C. Ionic product is less than solubility product, hence precipitate will from

D. Data insufficient

Answer: A

Watch Video Solution

16. Consider a sturated solution of silver chloride that is in contact with solid silver chloride. The solubility equilibrium can be represented as

$AgCl(s) \Leftrightarrow Ag^{+}(aq.) + Cl^{-}(aq.), \qquad K_{sp} = \left[Ag^{+}(aq.)\right]\left[Cl^{-}(aq.)\right]$

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equilibrium conditions we use the reaction quotient (Q) which is clled the ion or ionic prodect (Q) to predict whether a precipitate will from. Note that (Q) has the same for as K_{sp} are

$Q < K_{sp}$ Unsaturated solution

$Q = K_{sp}$ Saturated solution

$Q >_{sp}$ Supersaturated solution, precipitate will from

Will a precipitate from if 1 volume of 0.1 volume of 0.1 MPb^{2+} ion solution in mixed with 3 volume of 0.3 M Cl^{-} ion solution ? $\left[\text{Givem}: K_{sp}(PbCl_2) = 1.7 \times 10^{-5} M^3\right]$

A. Yes

B. No

C. Ionic product is less than solubility product, hence precipitate will from

D. Data insufficient

Answer: A

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17. Consider a sturated solution of silver chloride that is in contact with solid silver chloride. The solubility equilibrium can be represented as

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$Q < K_{sp}$ Unsaturated solution

$Q = K_{sp}$ Saturated solution

$Q >_{sp}$ Supersaturated solution, precipitate will from

At $25^{\circ}C,$ will a precipitate of Mg $(OH)_2$ from when a 0.0001 M solution of $Mg(NO_3)_2$ is adjusted to a pH of 9.0 ? At what minimum value of pH will precipition start ?

$\left[\text{Given: } K_{sp}\left(Mg(OH)_2\right) = 10^{-11}M^3\right]$

A. No,pH=3.5

B. No pH 10.5

C. No,pH=6.0

D. Yes, pH=8.5

Answer: B

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18. Determine the molar solubility of MgF_2 from its solubility product $K_{sp} = 4 \times 10^{-9}$:

A. 10^{-3}

B. 6.32×10^{-5}

C. 2×10^{-5}

D. None of these

Answer: A

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19. Consider a sturated solution of silver chloride that is in contact with solid silver chloride. The solubility equilibrium can be represented as

$AgCl(s) \Leftrightarrow Ag^{+}(aq.) + Cl^{-}(aq.), \qquad K_{sp} = \left[Ag^{+}(aq.)\right]\left[Cl^{-}(aq.)\right]$

Where K_{sp} is clled the solubility product constant or simply the solubility product. In general, the solubility product of a compound is the product of the molar concentrations of the constituent ions, each raised to the power of its stoichiometric coefficient in the equilibrium equation.

For concentrations of ions that do not necessarliy correpond to equilibrium conditions we use the reaction quotient (Q) which is clled the ion or ionic prodect (Q) to predict whether a precipitate will from. Note that (Q) has the same for as K_{sp} are

$Q < K_{sp}$ Unsaturated solution

$Q = K_{sp}$ Saturated solution

$Q >_{sp}$ Supersaturated solution, precipitate will from

The soluvility molar solubility of ferric hydroxide in aqueous solution is 6×10^{-38} at 298 K. the solubility of Fe^{3+} ion will increase when the :

A. pH is increased

B. pH is 7.0

C. pH is decreased

D. strurated solution is exposed to the atomosphere

Answer: A

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One Or More Answer Is Are Correct

1. Which is/are wrong statement (s) ?

A. Arrhenius acids are also Bronsted acids but all Arrhenius bases are not Bronsted base

B. All Lewis bases are Bronsted bases

C. All Bronsted acids are Lewis acids

D. Conjugate base of a strong acid is weak

Answer: B,C

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Assertin Reason Type Questions

1. STATEMENT-1: All strong monoprotic acid with same concentration in dilute solution show same pH.

STATEMENT-2: Water shows levelling effect.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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Subjective Problems

1. Calculate pOH of 0.1 M aq. Solution of weak base BOH $\left(K_b = 10^{-7}\right)$ at $25^\circ C$.

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Others

1. Which of the following are conjugate acid-base pairs ?

A. $HCO_3^- \, CO_3^{2-}$

B. $C_6H_5\overset{+}{N}H_3, C_6H_5NH_2$

C. $H_2PO_2^-, H_2PO_3^-, HC_2O_4^-$

D. OH^-, H^+

Answer: A,B

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2. Which are the set of amphiprotic species ?

A. $H_2O, H_2PO_4^-, HPO_4^-$

B. HPO_4^{2-}, HCO_3^-

C. $H_2PO_2^-, H_2PO_3^-, HC_2O_4^-$

D. $HPO_3^{2-}, H_2O, CO_3^{2-}$

Answer: A,b,C

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3. Which of the following statements is/are not correct ?

A. A substance which can provide OH^- in aqueous medium is a base

B. A substance which can accept a pair of electronis a base

C. A sumstance which can accept a proton in aqueous medium is a base

D. A substance which can donate a pair of electron is a base

Answer: B

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4. If degree of ionization (α) of a weak electrolyte AB is very less then α is :

A. Directly proportional to the square root of volume of solution

B. inversely proportional to the dilution

C. inversely proportional to the square root of concentration

D. directly proportional to concentration

Answer: A,C

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5. Factor influencing the degree of ionization of a weak electrolyte is :

A. dilution

B. temperature

C. presence of other ions

D. nature of solvent

Answer: A,B,C,D

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6. Which of the following statement (s) is/are correct about the ionic prodict of water ?

A. K_i (ionization constant of water) $< K_w$ (ionic product of water)

B. $pK_i > pK_w$

C. $At 300K$, K_w of water becomes 10^{-12}

D. Ionic product of water at $25^\circ C$ is 10^{-14}

Answer: A,B,C,D

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7. Which among the following statement is/are correct ?

A. $pH = -\log_{10}\left[H_3O^+\right]$ for dilute solution

B. pH of H_2O decreases with increase of temperature

C. pH can not more than 14

D. If a solution is diluted ten times, its pH always increases by 1

Answer: B,D

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8. If concentration of two weak acids are different and D.O.D (α) are very less then their relative strngth can be compared by :

A. $\frac{[H^+]_1}{[H^+]_2}$

B. $\frac{\alpha 1}{\alpha 2}$

C. $\frac{C_1\alpha_1}{C_2\alpha_2}$

D. $\frac{K_{a1}C_1}{K_{a2}C_2}$

Answer: A,C

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9. If concentration of two weak bases are same and D.O.D (α) are very less their ralative strength can be compared by :

A. $\frac{[OH^-]_1}{[OH^-]_2}$

B. $\frac{Kb_1}{Kb_2}$

C. $\frac{\alpha 1}{\alpha 2}$

D. $\frac{\sqrt{Kb_1}}{\sqrt{Kb_2}}$

Answer: D

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10. Which of the following expression is/are true ?

A. $\left[H^+\right] = \left[OH^-\right] = \sqrt{K_w}$ for a netural solution

B. $\left[OH^-\right] < \sqrt{K_w}$

C. pH+pOH=14 at all temperature

D. $\left[H^-\right] = 10^{-7}$ M for a netural solution at $25^\circ C$

Answer: A,D

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11. If K_{a_1}, K_{a_2} and $K_a \_ 3)$ be the first, second and third dissociation constant of H_3PO_4 and $K_{a_1} > > K_{2_a} > > K_{a_3}$ whis is/are correct :

A. $\left[H^+\right] \approx \sqrt{K_{a_1}[H_3PO_4]}$

B. $\left[H^+\right] \approx \left[HPO_4^{2-}\right]$

C. $K_{a_2} \approx \left[HPO_4^{2-}\right]$

D. $\left[HPO_4^{-2}\right] = \left[PO_4^{3-}\right]$

Answer: A,C

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12. Which of the following mixture constitute a buffer?

A. HCOOH+HCOONa

B. $Na_2CO_3 + NaHCO_3$

C. NaCl+HCl

D. $NH_4Cl + (NH_4)_2SO_4$

Answer: A,B

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13. Which of the following mixture can act as a buffer?

A. NaOH+HCOONa (1:1 molar ratio)

B. HCOOH+NaOH (2:1 molar ratio)

C. $NH_4Cl + NaOH$ (2:1 molar ratio)

D. HCOOH+NaOH (1:1 molar ratio

Answer: B

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14. Which of the following will function as buffer ?

A. NaCl+NaOH

B. Borax + boric acid

C. $NaH_2PO_4 + Na_2HPO_4$

D. $NH_4Cl + NH_4OH$

Answer: C

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15. Which of the following statements is/are correct?

A. The conjugate acid of NH_2^- is NH_3

B. Solubility product constant increases with increase in concentration of ions

C. On diluting a buffer solution pH change is negligible

D. In alkaline buffer solution, if some HCl is added, its $\left[OH^-\right]$ will increase

Answer: A,B,C

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16. Degree of hydrolysis (α) for a salt of strong acid and weak base is :

A. independent of dilution

B. increases with dilution

C. increases with decreases in K_b

D. increases with increase n temperature

Answer: B,C

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17. The compound whose 0.1 M solution is acidic :

A. Ammonium formate

B. Ammonium sulphate

C. Ammonium chloride

D. Sodium formate

Answer: B,C

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18. Formic acid is a weak acid and hydrochloric acid is a strong acid. It shows that the :

A. $\left[OH^{-}\right]$ of 0.01 M HCl (aq.) will be less than that of 0.01 M HCOOH (aq.)

B. aolution containing 0.1 M NaOH (aq.) and 0.1 M MCOONa (aq.) is a buffer solution

C. pH of 10^{-9} M HCl (aq.) will be approximately 7 at $25^{\circ}C$

D. ph of a solution formed by mixing equimolar quantities of HCOOH and HCl will be less than that of a similar solution formed HCOOH and HCOOONa

Answer: A,C,D

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19. If you have a saturated solution of CaF_2 then :

A. $\left[Ca^{2+}\right] = (K_{sp}/4)^{1/3}$

B. $2 \times \left[Ca^{2+}\right] = \left[F^{-}\right]$

C. $\left[Ca^{2+}\right] = 2\left[F^{-}\right]$

D. $\left[Ca^{2+}\right] = \sqrt{K_{sp}}$

Answer: A

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20. H_2A is a weak diprotic acid. If the pH of 0.1 M H_2A solution is 3 and concentration of A^{2-} is 10^{-12} at $25^{\circ}C$.

Select correct statement (s)

A. $\left[H^{+}\right]_{\text{total}} \approx \left[H^{+}\right]$ from first step of ionization of acid H_2A

B. Concentration of OH^{-} in solution is 10^{-3} M

C. The value of K_{a_1} is nearly 10^{-5}

D. $pK_{a_2} - pK_{a_1} = 9$

Answer: A,C

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21. Which is/are correct statement (s)?

A. CH_3COONH_4 have greater degree of hydrolysis in 0.2 M solution in comparision os 0.4 M solution.

B. Ahnions which are weaker base than OH^{-}, do not hydrolyse

C. The CH_3COO^{-}, have greater of hydrolysis in comparision of $HCOO^{-}$ when their salt solution have equal conc.

D. SO_4^{2-} hydrolyses but HSO_4^{-} does not undergo hydrolysis

Answer: C

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22. 0.01 M NH_4Cl (aq) solution at $25^\circ C$ has:

A. $[Cl]^-(aq) < 10^{-2}M$

B. $[NH_4]^+(aq) < 10^{-2}M$

C. $pOH < 7$

D. $\left[H^+\right] > 10^{-7}M$

Answer: B

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23. In an acidic indicator HIn has an ionization constant is 10^{-8}. The acid form of indicator is yellow and alkaline form is red. Which is correct

statement?

(Given : log2= 0.3, log3 = 0.48)

A. The pH range of indicator is 7 to 9

B. Change in pH is 0.96 when 75% yellow colour change to 75% red colour

C. This indicator is suitable for the titration of strong acid vs. strong base

D. pH of indicator is 8.3 when ration of acid from to alkaline from is 2.

Answer: A,B,C

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24. Match the following columns

Column-I	Column-II
(A) Conjugate acid-base pair	(P) Bronsted-Lowry concept
(B) Acid-base adduct	(Q) Lewis concept
(C) An acid-base reaction	(R) Arrhenius concept
(D) Proton donation	(S) $K_a \cdot K_b = K_w$

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25. Match the following columns

Column-I	Column-II
(A) $Fe(NO_3)_2(aq.)$	(P) Only cationic hydrolysis
(B) $KClO_4(aq.)$	(Q) Only anionic hydrolysis
(C) $HCOONa(aq.)$	(R) Both cationic as well as anionic hydrolysis
(D) $NH_4CN(aq.)$	(S) No hydrolysis

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26. Match the following columns

Column-I	Column-II
(A) Salt of weak acid and weak base	(P) $pH = 1/2\,[pK_w + pK_a + \log C]$
(B) Salt of weak acid and strong base	(Q) $pH = 1/2\,[pK_w + pK_a - pK_b]$
(C) Salt of strong acid and strong base	(R) $pH = 1/2\,[pK_w - pK_b - \log C]$
(D) Salt of strong acid and weak base	(S) $pH = 1/2\,[pK_w]$

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27. Match the following columns

Column-I	Column-II
(A) Salt of weak acid and weak base ($pK_a = pK_b$)	(P) pH of solution at 25°C less than 7
(B) Salt of weak acid and strong base	(Q) pH of solution at 25°C greater than 7
(C) Salt of strong acid and strong base	(R) pH of solution at 25°C equal to 7
(D) Salt of strong acid and weak base	(S) pH cannot be find until the value K_a/K_b is given

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28. Match the following columns

Column-I	Column-II
(A) pH of 0.1 M HA ($pK_a = 5$) and 0.01 M NaA	(P) 4
(B) pH of 0.1 M BOH ($pK_b = 6$) and 0.1 M BCl	(Q) 7
(C) pH of 0.1 M salt of weak acid ($pK_a = 5$) and weak base ($pK_b = 7$)	(R) 6
(D) pH of 500 litre of 0.02 M HNO_3 and 500 litre 0.01 M $Sr(OH)_2$	(S) 8

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29. Match the following columns

Column-I	Column-II
(A) CH_3COOH ($pK_a = 4.74, 0.1\ M$) + CH_3COONa ($0.1\ M$)	(P) Acidic buffer at its maximum capacity
(B) CH_3COOH ($0.1\ M$) + HCl ($0.1\ M$)	(Q) Buffer solution
(C) CH_3COOH ($pK_a = 4.74, 0.1\ M$) + NH_4OH ($pK_b = 4.74, 0.1\ M$)	(R) pH < 7 at 25°C
(D) CH_3COONa (300 mL of $0.1\ M$) + HCl (100 mL of $0.1\ M$)	(S) pH = 7 at 25°C

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30. Match the following columns

Column-I	Column-II
(A) Titration of a strong acid with strong base	(P) Methyl orange (3.1 – 4.4)
(B) Titration of weak acid with strong base	(Q) Methyl red (4.2 – 6.3)
(C) Titration of strong acid with weak base	(R) Phenolphthalein (8.3 – 10)
(D) Titration of weak acid with weak base	(S) No general indicator is suitable

Watch Video Solution

31. Match the following columns

Column-I		Column-II
(A) Mercurous iodide	(P)	$108\ S^5$
(B) Aluminium phosphate	(Q)	$4\ S^3$
(C) Calcium phosphate	(R)	S^2
(D) Zirconium phosphate	(S)	$6912\ S^7$

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32. statement-1: If water is heated of $50^\circ C$ then pH will increase.

STATEMENT-2: K_w increases with increase in temperature.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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33. STATEMENT-1: Addition of HCl (aq.) to HCOOH(aq.) decrease the dissociation of HCOOH(aq.)

STATEMENT-2: Due to common ion effect of H^+, dissociation of HCOOH decrease.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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34. STATEMENT-1: pH of 10^{-7} M HCl is less than 7 at $25^{\circ}C$.

STATEMENT-2: At very low concentration of HCl, contribution of H^{+} from water is considerable.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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35. STATEMENT-1: The dissociation constants of weak diprotic acid are in the order of $K_{a_1} > K_{a_2}$

STATEMENT-2: Removal of H^+ from anion is difficult as compared to neutral molecule.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: A

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36. STATEMENT-1: When 0.1 M weak diprotic acid H_2A dissociated with its dissociation constants $K_{a_1} = 10^{-3}$ and $K_{a_2} = 10^{-8}$, then $\left[A^{2-}\right]$ is almost equal to 10^{-3} M

STATEMENT-2: Since $K_{a_2} < < K_{a_1}$ for 0.1 M H_2A, $so\left[A^{2-}\right]$ is negligible w.r.t. $\left[HA^{-}\right]$

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: D

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37. Statement-1: pH value of acidic buffer solution changes , If buffer solution is diluted upto very large extent.

Statement-2: $\left[H^{+}\right]$ decreases due to change in concentration as well as α increases and decreases in concentration is more as compared to increases in α .

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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38. Assertion : In a titration of weak monoprotic acid with strong base, the pH at the half equivalence point is pK_a.

Reason : At half equivalence point, it will form acidic buffer at its maximum capacity where [acid] $=$ [salt].

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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39. Assertion: In the titration of Na_2CO_3 with HCl using methyl orange indicator, the volume of acid required is twice that of the acid required using phenolphthalein as indicaton.

Reason: Two moles of HCl are required for the complete neutralisation of one mole of Na_2CO_3.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: A

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40. STATEMENT-1: In the acid-base titration involving strong base and weak acid, methyl red can be used as an indicator.

STATEMENT-2: Methyl red changes its colour in the pH range 4.2 to 6.3.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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41. STATEMENT-1: Sparingly soluble salts AB and XY_2 with the same solubility product, will have different solubility.

STATEMENT-2: Solubiluty of sparingly soluble salt depend upon solubility product.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: C

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42. STATEMENT-1: Solubility product of BaF_2 will increase on dilution.

STATEMENT-2: Solubility of BaF_2 will change on changing temperature.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: D

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43. STATEMENT-1: Solubility of sparingly soluble salt decreases due to common ion effect.

STATEMENT-2: Solubility product constant does not depend on common ion effect.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: B

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44. Assertion : Solubility of $AgCl$ in $NH_3(aq)$ is greater than in pure water.

Reason : When $AgCl$ dissolve in $NH_3(aq)$, complex ion $[Ag(NH_3)_2^+]$ formation takes place and solubility equilibrium of $AgCl_3$ shifted in forward direction.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: A

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45. Assertion (A): Solubility of $AgCN$ in acidic solutions is greater than in pure water.

Reason (R) : Solubility equilibrium of $AgCN$ is shifted in forward direction due to the formation of HCN.

A. If both the statements are TRUE and STATEMENT-2 is the correct explation of STATEMENT-1

B. If both the statements are TRUE AND STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMETN-2 is FLASE

D. If STATEMENT-1 is FLASE and STATEMENT-2 is TRUE

Answer: A

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46. pH of 0.01 M aq. solution of HA is 4. Find the value of pK_a of HA at $25^\circ C$.

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47. Calculate approximate pH of 10^{-10} M NaOH at $25^\circ C$.

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48. Calculate pH of a resultant solution of 25 mL of 0.1 M HCl, 50 mL of 0.02 M HNO_3 and 25 mL of 0.1M NaOH

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49. Calculate pH of a resultant solution of 0.1 M HA $\left(K_a = 10^{-6}\right)$ and 0.5 M HB $\left(K_a = 2 \times 10^{-6}\right)$ at $25^\circ C$.

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50. 0.16g of N_2H_4 are dissolved in water and the total volume made upto 500 mL. Calculate the percentage of N_2H_4 that has reacted with water in this solution. (K_b for $N_2H_4 = 4.0 \times 10^{-6}$)

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51. Calculate pH of a buffer solution that contains 0.1M $NH_4OH\left(K_b = 10^{-5}\right)$ and 0.1 M NH_4Cl.

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52. Calculate the ratio of sodium formate and formic acid $\left(K_a = 2 \times 10^{-4}\right)$ in a buffer solution of pH=4.3.

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53. What is the pOH of 0.1 M KB (salt of weak acid and strong base) at $25^\circ C$? (Given : $pK_b of B^-$ =7)

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54. A certain weak acid has $K_a = 10^{-5}$. If the equilibrium constant for a reaction with a strong base is represented as 1×10^y then find the value of y.

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55. If solubility of AgCl in 0.2 M solution of $AgNO_3$ is represented as $y \times 10^{-10}$ then find the value of y.

$\left(\text{Given: } K_{sp\,(AgCl)} = 10^{-10}\right)$

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56. When one litre of a saturated solution of $PbCl_2$ (mol. Mass=278) is evaported, the residue is found to weight 2.78g. If K_{sp} of $PbCl_2$ is represented as $y \times 10^{-6}$ then find the value of y.

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57. A solution is saturated in $SrCO_3$ and SrF_2 The CO_3^{2-} was found to be 10^{-3} mol/L. If the concentration of F^- in solution is represented as $y \times 10^{-2}$ M then what is the value of y ?

$\left[\text{Given: } K_{sp}(SrCO_3) = 2.5 \times 10^{-10}, K_{sp}(SrF_2) = 10^{-10}\right]$

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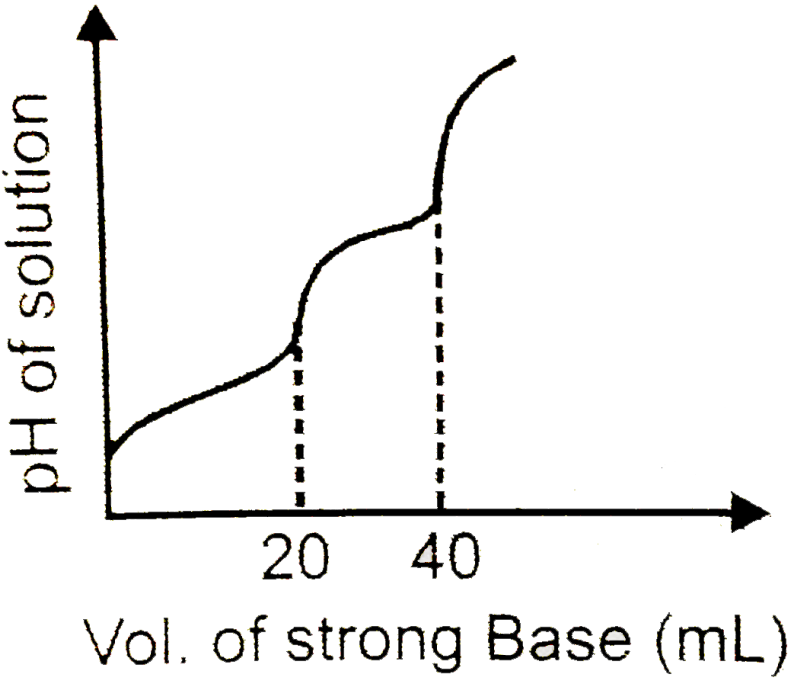
58. 10 mL of H_2A(weak diprotic acid) solution is titrated against 0.1M NaOH. pH of the solution is plotted against volume of strong base added and following observation is made. If pH of the solution at first equivalence point is pH_1 and at second equivalence point is pH_2. Calculate the value of $(pH_2 - pH_1)$ at $25^\circ C$

Given for H_2A, pK_{a_1} =4.6 and pK_{a_2} =8, log 25=1.4



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59. Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is:

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