CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

IONIC EQUILIBIUM

Type Of Acids And Bases And Ostwid'S Dilution Law

1. Dissociation constants of two acids HA and HB are respectively 4×10^{-10} and 1.8×10^{-5}, whose pH value will be higher for a given molarity:

A. HA

B. HB

C. Both same

D. Can't say

Answer: A

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2. A monoprotic acid in $1.00M$ solution is 0.01% ionised. The dissociation constant of this acid is

A. 1×10^{-8}

B. 1×10^{-4}

C. 1×10^{-6}

D. 10^{-5}

Answer: A

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3. The dissociation constants of two acids HA_1 and HA_2 are 3.0×10^{-4} and 1.8×10^{-5} respectively. The relative strengths of the acids will be approximately

A. $1:4$

B. $4:1$

C. $1:16$

D. $16:1$

Answer: B

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4. Which of the following can act both as Bronsted acid and as Bronsted base ?

A. Cl^{-}

B. HCO_3^{-}

C. H_3O^{+}

D. OH^{-}

Answer: B

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5. pH of water is 7.0 at $25^\circ C$. If water is heated to $70^\circ C$, the:

A. pH will decrease and solution becomes acidic

B. pH will increase

C. pH will remain constant as 7

D. pH will decrease but solution will be neutral

Answer: D

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6. The equivalent conductance at infinite dilution of a weak acid such as HF

A. Can be determined by measurement of very dilute HF solution

B. Can be determined by extrapoltaion of measurements on dilute solutions of HCl, HBr and HI

C. Can best be determined from measurements on dilute solutions of NaF, $NaCl$ and HCl

D. Is an underfined quantity

Answer: C

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7. $100ml$ of $0.2MH_2SO_4$ is added to $100ml$ of $0.2MNaOH$. The resulting solution will be

A. Acidic

B. Basic

C. Neutral

D. Slightly basic

Answer: A

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8. K_a for formic acid and acetic acid are 2.1×10^{-4} and 1.1×10^{-5} respectively. The relative strength of acids is:

A. $19:1$

B. $2.3:1$

C. $1:2.1$

D. $4.37:1$

Answer: D

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9. In the following reaction $HC_2O_4^-(aq) + PO_4^{3-}(aq) \Leftrightarrow HPO_4^{-2}(aq) + C_2O_4^{2-}(aq)$, which are the two Bronsted bases?

A. $HC_2O_4^-$ and PO_4^{3-}

B. HPO_4^{2-} and $C_2O_4^{2-}$

C. $HC_2O_4^-$ and HPO_4^{2-}

D. PO_4^{3-} and $C_2O_4^{2-}$

Answer: D

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10. The following equilibrium is established when $HC1O_4$ is dissolved in weak acid HF,

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

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

A. HF and $HClO_4$

B. HF and ClO_4^-

C. HF and H_2F^+

D. $HClO_4$ and H_2F^+

Answer: C

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11. $10ml$ of $1MH_2SO_4$ will completely neutralise

A. $10ml$ of $1MNaOH$ solution

B. $10ml$ of $2MNaOH$ solution

C. $5ml$ of $2MKOH$ solution

D. $5ml$ of $1MNa_2CO_3$ solution

Answer: B

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12. Boric acid H_3BO_3 is a:

A. Arrhenius acid

B. Bronsted acid

C. Lewis acid

D. All of these

Answer: C

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13. The hydrogen ion concentration in weak acid of dissociation constant K_a and concentration c is nearly equal to

A. $\sqrt{K_a / c}$

B. c / K_a

C. $K_a c$

D. $\sqrt{K_a c}$

Answer: D

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14. For $10^{-2}(M)H_3PO_3$ solution which of the following relations is correct?

A. $[H_3PO_3]+[H_2PO_3^-]+[HPO_3^{2-}]+[PO_3^{2-}]=10^{-2}$

B. $[H_3PO_3]+[H_2PO_3^-]+[HPO_3^{2-}]=10^{-2}$

C. $[H_2PO_3^-]+[HPO_3^{2-}]+[PO_3^{3-}]=10^{-2}$

D. $[H_3PO_3]+[H_2PO_3^-]+2[HPO_3^{2-}]=10^{-2}$

Answer: B

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15. When $100ml$ of $1MNaOH$ solution is mixed with $10ml$ of $10MH_2SO_4$, the resulting mixture will be

A. Acidic

B. Alkaline

C. Neutral

D. Strongly alkaline

Answer: A

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16. What is the concentration of $Ag^+ ion$ in a $1L$ solution containing $0.02mol$ of $AgNO_3$ and $0.14mol$ of NH_3 ? For

$\left[Ag(NH_3)_2\right]^+, K_{Instab} = 10^8$

A. $2 \times 10^{-7}(M)$

B. $10^{-8}(M)$

C. $2 \times 10^{-8}(M)$

D. $2 \times 10^{-9}(M)$

Answer: C

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17. In a solution total concentration of M^{3+} is $2 \times 10^{-3}(M)$ and total concentration of SCN^- is $1.51 \times 10^{-3}(M)$ and free SCN^- concentration $= 1 \times 10^{-5}(M)$

What is the dissociation constant of the complex $M(SCN)^{2+}$?

A. 2×10^5

B. 2×10^{-5}

C. 3.33×10^5

D. 3.33×10^{-6}

Answer: D

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18. The salt that forms neutral solution in water is

A. NH_4Cl

B. $NaCl$

C. Na_2CO_3

D. K_3BO_3

Answer: B

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19. The dissociation constant of a monobasic acid which is 3.5% dissociated in $\frac{N}{20}$ solution at $20^\circ C$ is

A. 3.5×10^{-2}

B. 5×10^{-3}

C. 6.34×10^{-5}

D. 6.75×10^{-2}

Answer: C

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20. Which of the following substance is an electrolyte?

A. Chloroform

B. Benzene

C. Toluene

D. Magnesium chloride

Answer: D

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21. The species among the following which can act as an acid and as a base is

A. HSO_4^-

B. SO_4^{2-}

C. H_3O^+

D. Cl^-

Answer: A

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22. The dissociation constant of weak acid HA is 4.9×10^{-8}. After making the necessary approximations, calculate pH in $0.1M$ acid.

A. 1.155

B. 2.155

C. 3.155

D. 4.155

Answer: D

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23. The K_a for formic acid and acetic acid are 2×10^{-4} and 2×10^{-5} respectively. Calculate the relative strength of acids with same molar concentration

A. $\sqrt{10}$

B. $\sqrt{7}$

C. $\sqrt{8}$

D. $\sqrt{5}$

Answer: A

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24. Which among the following is strongest acid ?

A. $H(ClO)O_2$

B. $H(ClO)O_3$

C. $H(ClO)O$

D. $H(ClO)$

Answer: B

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25. Calculate pH of $0.002 N NH_4OH$ having 2% dissociation

A. 7.6

B. 8.6

C. 9.6

D. 10.6

Answer: C

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26. What concentration of acetic acid is needed to give a hudrogen ion concentration of $3.5 \times 10^{-4} M$?

$(K_a = 1.8 \times 10^{-5})$?

A. $3.5 \times 10^{-4} M$

B. $6.80 \times 10^{-3} M$

C. $4.2 \times 10^{-4} M$

D. $7.2 \times 10^{-4} M$

Answer: B

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27. A solution of acetic acid is 1.0% ionised. Determine the molar concentration of acid $\left(K_a = 1.8 \times 10^{-5}\right)$ and also the $\left[H^{+}\right]$.

A. $1.8 \times 10^{-1} M$ and $1.8 \times 10^{-3} M$

B. $0.18 \times 10^{-1} M$ and $1.8 \times 10^{-4} M$

C. $0.18 \times 10^{-2} M$ and $1.8 \times 10^{-2} M$

D. $0.18 \times 10^{-3} M$ and $1.8 \times 10^{-1} M$

Answer: A

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28. BOH is a weak base, molar concentration of BOH that provides a $[OH]^{-}$ of $1.5 \times 10^{-3} M \left[K_b(BOH) = 1.5 \times 10^{-5} M\right]$ is

A. $0.15M$

B. $0.1515M$

C. $0.0015M$

D. $1.5 \times 10^{-5} M$

Answer: A

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29. Lemon juice normally has a pH of 2. If all the acid the lemon juice is citric acid and there are no citrate salts present, then what will be the citric acid concentration $[Hcit]$ in the lemon juice? (Assume that only the first hydrogen of citric acid is important)

$HCit \Leftrightarrow H^{+} + Cit^{-}, K_a = 8.4 \times 10^{-4} molL^{-1}$

A. $8.4 \times 10^{-4} M$

B. $4.2 \times 10^{-4} M$

C. $16.8 \times 10^{-4} M$

D. $11.9 \times 10^{-2} M$

Answer: D

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30. Strongest conjugate base is

A. $C1^{-}$

B. Br^{-}

C. F^{-}

D. I^{-}

Answer: C

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31. $0.2M$ solution of a weak acid HA is 1% ionised $25^{\circ}C$.

K_a for the acid is equal to

A. $\frac{0.002 \times 0.002}{0.198}$

B. $\frac{0.02 \times 0.02}{0.18}$

C. $\frac{0.01 \times 0.01}{0.19}$

D. $\frac{0.19}{0.01 \times 0.01}$

Answer: A

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32. An aqueous solution of aluminium sulphate would show

A. An acidic reaction

B. An neutral reaction

C. An basic reaction

D. Both acidic and basic reaction

Answer: A

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33. Which of the following has highest proton affinity?

A. NH_3

B. PH_3

C. H_2O

D. H_2S

Answer: A

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

A. HPO_4^{2-}

B. P_2O_5

C. H_3PO_4

D. PO_4^{3-}

Answer: A

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35. According to Bronsted principle, an aqueous solution of HNO_3 will contain

A. NO_2^-

B. NO_3^-

C. NO_2^+

D. NO^+

Answer: B

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36. The conjugate base of OH^- is :

A. O_2

B. H_2O

C. O^-

D. O^{2-}

Answer: D

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37. Would gaseous HCl be considered as an Arrhenius acid?

A. Yes

B. No

C. Not known

D. Gaseous HCl does not exist

Answer: B

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38. The first and second dissociation constant of an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} respectively. The overall dissociation constant of the acid will be

A. 5.0×10^{-5}

B. 5.0×10^{15}

C. 5.0×10^{-15}

D. 0.2×10^{5}

Answer: C

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39. An aqueous solution of sodium carbonate is alkaline because sodium carbonate is a salt of

A. Weak acid and weak base

B. Strong acid and weak base

C. Weak acid and strong base

D. Strong acid and strong base

Answer: C

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40. Four species are listed below:

$(i)\ HCO_3^-$

(ii) H_3O^+

(iii) HSO_4^-

(iv) HSO_3F

Which one of the following is the correct sequence of their acid strength?

A. $iv < ii < iii < i$

B. $ii < iii < i < iv$

C. $i < iii < ii < iv$

D. $iii < i < iv < ii$

Answer: C

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41. Ammonia gas dissolves in water to form NH_4OH. In this reaction water acts as

A. A conjugate base

B. A non-polar solvent

C. An acid

D. A base

Answer: C

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42. The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionisation constant, K_a of the acid is

A. 3×10^{-1}

B. 1×10^{-3}

C. 1×10^{-5}

D. 1×10^{-7}

Answer: C

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43. Orthoboric acid in aqueous medium is

A. Monobasic

B. Dibasic

C. Tribasic

D. All are correct

Answer: A

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44. Three reactions involving $H_2PO_4^-$ are given below

$I.\ H_3PO_4 + H_2O \rightarrow H_3O^+ + H_2PO_4^-$

$II.\ H_2PO_4^- + H_2O \rightarrow HPO_4^{2-} + H_3O^+$

$III.\ H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{2+}$

In which of the above does $H_2PO_4^-$ act as an acid?

A. II only

B. I and II

C. III only

D. I only

Answer: A

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Ph, Pkw And Ph Mixture Of Acid And Bases

1. If the degree of ionization of water be 1.8×10^{-9} at $298K$. Its ionization constant will be

A. 1.8×10^{-16}

B. 1×10^{-14}

C. 1×10^{-16}

D. 1.67×10^{-14}

Answer: A

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2. 10^{-2} mole of $NaOH$ was added to $10 litres$ of water. The pH will change by

A. 4

B. 3

C. 11

D. 7

Answer: A

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3. For an aqueous solution to be neutral it must have

A. $pH = 7$

B. $[H^{+}] = [OH^{-}]$

C. $[H^{+}] = \sqrt{K_w}$

D. $[H^{+}] < [OH^{-}]$

Answer: B

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4. If an aqueous solution at $25^{\circ}C$ has twice as many OH^{-} as pure water its pOH will be

A. 6.699

B. 7.307

C. 7

D. 6.98

Answer: A

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5. The pH of an aqueous solution of $0.1M$ solution of a weak monoprotic acid which is 1% ionised is

A. 1

B. 2

C. 3

D. 11

Answer: C

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6. pH of a $10^{-10}MNaOH$ is nearest to

A. 10

B. 7

C. 4

D. 10

Answer: B

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7. The following reaction takes place in the body

$CO_2 + H_2O \Leftrightarrow H_2CO_3 \Leftrightarrow H^+ + HCO_3^-$. If CO_2 escapes from the system

A. pH decrease

B. $[H^+]$ will decrease

C. $[H_2CO_3]$remains the same

D. forward reaction will be promoted

Answer: B

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8. Equal volumes of two solutions of a strong acid having $pH3$ and $pH4$ are mixed together. The pH of the resulting solution will then be equal to

A. 3.5

B. 3.26

C. 7

D. 1.0

Answer: B

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9. Let K_w at $100^\circ C$ be $5.5 \times 10^{-13} M^2$. If an aqueous solution at this temperature has $pH = 6.2$. Its nature will be

A. acidic

B. alkaline

C. neutral

D. can't say

Answer: B

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10. pH value of pure water at $0^\circ C$ will be?

A. Greater than 7

B. Less than 7

C. 7

D. All of these

Answer: A

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11. If pK_b for fluoride ion at $25^\circ C$ is 10.83, the ionization constant of hydrofluroic acid in water at this temparature is

A. 1.74×10^{-5}

B. 3.52×10^{-3}

C. 6.95×10^{-4}

D. 5.38×10^{-2}

Answer: C

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12. $10^{-6} MHCl$ is diluted to 100 times. Its pH is:

A. 6.0

B. 8.0

C. 6.95

D. 9.5

Answer: C

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13. A certain weak acid has a dissociation constant 1.0×10^{-4}. The equilibrium constant for its reaction with a strong base is :

A. 1.0×10^{-4}

B. 1.0×10^{-10}

C. 1×10^{-10}

D. 1.0×10^{-14}

Answer: C

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14. $10mL$ of $10^{-6}MHCl$ solution is mixed with $90mLH_2O$. pH will change approximately:

A. By one unit

B. By 0.3 unit

C. By 0.7 unit

D. By 0.1 unit

Answer: C

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15. At $25^{\circ}CK_b$ for $BOH = 1.0 \times 10^{-12}.0.01M$ solution of BOH has $\left[OH^{-}\right]$:

A. $1.0 \times 10^{-6}M$

B. $1.0 \times 10^{-7} M$

C. $1.0 \times 10^{-5} M$

D. $2.0 \times 10^{-6} M$

Answer: B

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16. Which of the following is true

A. pK_b for OH^- is -1.74 at $25^\circ C$

B. The equilibrium constant for the reaction between $HA(pK_a = 4)$ and $NaOH$ at $25^\circ C$ will be equal to 10^{10}.

C. The pH of a solution containing $0.1 M HCOOH$

$(K_a = 1.8 \times 10^{-4})$ and $0.1 M HOCN$

$(K_a = 3.2 \times 10^{-4})$ will be nearly $(3 - \log 7)$.

D. all the above are correct.

Answer: C

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17. pOH water is $7.0 at 298 K$. If water is heated to $350 K$, which of the following should be ture?

A. pOH will decrease.

B. pOH will increase.

C. pOH will remain 7.0.

D. concentration of H^{+} ions will increase but that of OH^{-} will decrease.

Answer: A

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18. In pure liquid of $HCOOH$, concentration of $HCOO^{-} = 10^{-3}M$ at $27^{\circ}C$. What is the self- ionisation constant $\left(K = \left[HCOOH^{2+}\right]\left[HCOO^{-}\right]\right)$

A. 10^{-3}

B. 10^{3}

C. 10^{6}

D. 10^{-6}

Answer: D

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19. At certain temperature K_w for water 4×10^{-14} which of the following is incorrect for pure water at the given temperature?

$\log 2 = 0.3$

A. $pH = 6.7$ and water is acidic

B. $pH = 6.7$ and water is neutral

C. $pOH = 6.7$ and water is neutral

D. $pH + pOH = 13.4$

Answer: A

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20. The pH of $Ba(OH)_2$ solution is 13. The number millimoles of $Ba(OH)_2$ present in $10ml$ of solution would be

A. 1.00

B. 0.50

C. 10.00

D. 15.00

Answer: B

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21. The pH of $0.01(M)KOH$ is 12, if the temperature of the given KOH solution is increased which of the following would occur?

A. Both pH and pOH would remain constant

B. pH would be decreased but pOH remains constant

C. pH would be increased while pOH remains constant

D. pH would be increased while pOH would be decreased

Answer: B

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22. The number of S^{2-} ions present in $1L$ of $0.1(M)H_2S$ solution having $\left[H^+\right] = 0.1(M)$ is

(Given $H_2S \Leftrightarrow 2H^+ + S^{2-} K_a = 1.1 \times 10^{-21}$)

A. 6.625×10^3

B. 6.625×10^4

C. 6.625×10^5

D. 6.625×10^6

Answer: A

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23. A $50ml$ solution of $pH = 1$ is mixed with a $50ml$ solution of $pH = 2$. The pH of the mixture will be nearly

A. 0.76

B. 1.26

C. 1.76

D. 2.26

Answer: B

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24. To make a solution of $pH = 12$, the amount of $NaOH$ dissolved in one litre of the solution should be

A. $0.1g$

B. $0.2g$

C. $0.4g$

D. $1.2g$

Answer: C

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25. The pH of $0.5M$ aqueous solution of HF $\left(K_a = 2 \times 10^{-4}\right)$ is

A. 2

B. 4

C. 6

D. 10

Answer: A

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

A. $3.7 \times 10^{-3} M$

B. $1.11 \times 10^{-3} M$

C. $1.11 \times 10^{-4} M$

D. $3.7 \times 10^{-4} M$

Answer: D

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27. The rate constant at $25^\circ C$ for the reaction of NH_4^+ and OH^- to form NH_4OH is $4 \times 10^{10} M^{-1} \sec^{-1}$ and ionisation constant of aq. NH_3 is 1.8×10^{-5}. The rate constant of proton transfer to NH_3 is

A. 1.8×10^{-5}

B. 7.2×10^5

C. 3.6×10^5

D. 4.2×10^{-5}

Answer: B

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28. How many hydrogen ions are present in $1ml$ of a solution of $pH = 13$?

A. 6.02×10^{13}

B. 6.02×10^{12}

C. 6.02×10^{7}

D. 6.02×10^{5}

Answer: C

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29. The pH of a $0.05M$ solution of H_2SO_4 in water is nearly

A. 0.05

B. 1

C. -1

D. 0

Answer: B

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30. The pH of a $0.01M$ solution of a monobasic acid is four. Which one of the following statement about the acid is incorrect

A. When a little $NaOH$ is added, it will form a buffer solution

B. It is a weak acid

C. Its sodium salt will be acidic

D. Its sodium salt will be basic

Answer: C

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31. Calculate the pH of solution obtained by mixing $10ml$ of $0.1MHCl$ and $40ml$ of $0.2MH_2SO_4$

A. 0.3685

B. 0.4685

C. 1.3685

D. 1.4684

Answer: B

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32. Find the pH of solution prepared by mixing $25ml$ of a $0.5M$ solution of HCl, $10ml$ of a $0.5M$ solution of $NaOH$ and $15ml$ of water

A. 0.8239

B. 1.0029

C. 1.0239

D. 1.8239

Answer: A

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33. Calculate the pH of a solution which contains $10ml$ of $1MHCl$ and $10ml$ of $2MNaOH$

A. 11.7

B. 12.7

C. 13.7

D. 10.7

Answer: C

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34. Calculate pH of a solution whose $100ml$ contains $0.2gNaOH$ dissolved in it.

A. 10.699

B. 11.699

C. 12.699

D. 13.699

Answer: C

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35. Which of the following has pH is equal to near about one?

A. $100ml\frac{M}{10}HCl + 100ml\frac{M}{10}NaOH$

B. $55ml\frac{M}{10}HCl + 44ml\frac{M}{10}NaOH$

C. $10ml\frac{M}{10}HCl + 90ml\frac{M}{10}NaOH$

D. $75ml\frac{M}{10}HCl + 25ml\frac{M}{10}NaOH$

Answer: D

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36. The hydrogen ion concentration of a $10^{-8}MHCl$ aqueous soultion at $298K(K_w = 10^{-14})$ is

A. $9.525 \times 10^{-8}M$

B. $1.0 \times 10^{-8}M$

C. $1.0 \times 10^{-6}M$

D. $1.0525 \times 10^{-7} M$

Answer: D

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37. A reaction $CaF_2 \Leftrightarrow Ca^{2+} + 2F^-$ is at equilibrium. If the concentration of Ca^{2+} is increased four times, what will be the change in F^- concentration as compared to the initial concentration of F^-?

A. $\frac{1}{4}$ times

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

C. 4 times

D. 2 times

Answer: B

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38. What molar concentration of ammonia will provide a hydroxyl ion concentration of 1.5×10^{-3}? $\left(K_b = 1.8 \times 10^{-5}\right)$

A. $0.125M$

B. $0.12M$

C. $0.13M$

D. $0.14M$

Answer: C

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39. An acid solution of $pH = 6$ is diluted 1000 times, the pH of the final solution is

A. 6.99

B. 6.0

C. 3.0

D. 9.0

Answer: A

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40. What will be the pH of a solution formed by mixing $40ml$ of $0.10 M HCl$ with $10ml$ of $0.45 M NaOH$?

A. 12.0

B. 10.0

C. 8.0

D. 6.0

Answer: A

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41. $2H_2O \Leftrightarrow H_3O^+ + OH^-$

$K_w = 1 \times 10^{-14}$ at $25^\circ C$. Hence, K_a is:

A. 1×10^{-14}

B. 5.55×10^{-13}

C. 1.8×10^{-16}

D. 1.00×10^{-7}

Answer: C

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42. Equal volumes of two soultion, one having $pH6$ and the other having$pH4$ are mixed. The pH of the resulting solution would be

A. 5.7

B. 4.3

C. 5.0

D. 5.5

Answer: B

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43. A solution is prepared by dissolving $5.6g$ of KOH per litre of solution. pOH of the solution would be

A. $10^{-0.1}$

B. 10^{-1}

C. 1

D. 13

Answer: C

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44. $\left[OH^{-}\right]$ in a solution is $1 mol L^{-1}$. The pH of the solution is

A. 1

B. 0

C. 14

D. 10^{-14}

Answer: C

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45. If $K_a = 10^{-5}$ for a weak acid, then pK_b for its conjugate base would be

A. 10^{-10}

B. 9

C. 10^{-9}

D. 5

Answer: B

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46. The dissociation constant of an acid is 1×10^{-5}. The pH of its $0.1M$ solution will be approximately

A. 6

B. 4

C. 3

D. 5

Answer: C

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47. For $NH_3, K_b = 1.8 \times 10^{-5}. K_a$ for NH_4^+ would be

A. 1.8×10^5

B. 5.56×10^5

C. 1.8×10^{10}

D. 5.56×10^{-10}

Answer: D

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48. A solution of HCl contains $0.1920g$ of an acid in $0.5 litre$ of a solution. The degree of dissociation is 95%. The pH of the solution is

A. 4.0

B. 2.0

C. 2.192

D. 1.92

Answer: B

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49. $10^{-6} MNaOH$ is diluted by 100 times. The pH of diluted base is

A. Between 6 and 7

B. Between 10 and 11

C. Between 7 and 8

D. Between 5 and 6

Answer: C

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50. Which statement is not true?

A. pH of $1 \times 10^8 MHCl$ is 8

B. 96500 coulomb deposits $1g$ equivalent of copper

C. Conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

D. $pH + pOh = 14$ for all aqueous solution

Answer: A

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51. When rain is accompained by a thunderstorm, the collected rain water will have a pH:

A. Influenced by occurrence of thunder storm

B. Depends upon the amount of dust in water

C. Slightly lower than that of rain water without thunderstorm

D. Slightly higher than that when thunderstorm is not there

Answer: C

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52. Hydrogen ion concentration in mol/L in a solution of $pH = 5.4$ will be:

A. 3.98×10^{8}

B. 3.88×10^{6}

C. 3.68×10^{8}

D. 3.98×10^{-6}

Answer: D

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53. The pK_a of a weak acid, HA, is 4.80. The pK_b of a weak base, BOH, is 4.78. The pH of an aqueous solution of the corresponding salt, BA, will be:

A. 8.58

B. 4.79

C. 7.01

D. 9.22

Answer: C

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54. How many litres of water must be added to $1L$ of an aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2?

A. $0.1L$

B. $0.9L$

C. $2.0L$

D. $9.0L$

Answer: D

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55. An acid HA ionizes as $HA \Leftrightarrow H^{+} + A^{-}$ The pH of $1.0M$ solution is 5. Its dissociation constant would be

A. 1×10^{-10}

B. 5

C. 5×10^{-8}

D. 1×10^{-5}

Answer: A

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Salt Hydrolysis

1. If K_h (hydrolysis constant) for anilinium ion is $2.4 \times 10^{-5} M$, then K_b for aniline will be

A. 4.1×10^{10}

B. 4.1×10^{-10}

C. 2.4×10^{9}

D. 2.4×10^{-19}

Answer: B

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2. The aqueous solution of $FeCl_3$ is acidic due to

A. Acidic impurities

B. Ionisation

C. Hydrolysis

D. Dissociation

Answer: C

Watch Video Solution

3. The aqueous solution of potash alum is acidic due to hydrolysis of

A. K^{+}

B. Al^{3+}

C. SO_4^{--}

D. presence of acid in its crystal as impurity

Answer: B

Watch Video Solution

4. Which is least soluble in water?

A. $AgCl$

B. AgF

C. Agl

D. Ag_2S

Answer: D

Watch Video Solution

5. A white salt is readily soluble in water and gives a colourless solution with a pH of about 9. The salt would be

A. NH_4NO_3

B. CH_3COONa

C. CH_3COONH_4

D. $CaCO_3$

Answer: B

Watch Video Solution

6. If acetic acid mixed with sodium acetate, then $H^+ ion$ concentration will be

A. Increased

B. Decreased

C. Remains unchanged

D. pH decreased

Answer: B

Watch Video Solution

7. pH for the solution of salt undergoing anionic hydrolysis (say CH_3COONa) is given by:

A. $pH = 1/2[pK_w + pK_a + \log C]$

B. $pH = 1/2[pK_w + pK_a - \log C]$

C. $pH = 1/2[pK_w + pK_b - \log C]$

D. None of these

Answer: A

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8. An aqueous solution of sodium carbonate has a pH greater than 7 because

A. It contains more carbonate ions than H_2O molecules

B. It cantains more hydroxide ions that carbonate ions

C. Na^+ ions react with water

D. Carbonate ions react with H_2O

Answer: B

Watch Video Solution

9. Which of the following salts when dissolved in water with get hydrolysed?

A. $NaCl$

B. NH_4Cl

C. KCl

D. Na_2SO_4

Answer: B

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10. pH of $0.01 M HS^-$ will be:

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

B. $pH = 7 - \frac{pK_a}{2} + \frac{\log C}{2}$

C. $pH = 7 + \frac{pK_1 + pK_2}{2}$

D. $pH = 7 + \frac{(pK_a + pK_b)}{2}$

Answer: A

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11. An aqueous solution of CH_3COONa will be

A. Acidic

B. alkaline

C. neutral

D. None of these

Answer: B

Watch Video Solution

12. In which of the following salt hydrolysis takes place

A. KCl

B. $NaNO_3$

C. CH_3COOK

D. K_2SO_4

Answer: C

Watch Video Solution

13. When $0.1m\text{mole}$ of solid $NaOH$ is added in $1L$ of $0.1MNH_3(aq)$ then which statement is going to be wrong?

$\left(K_b = 2 \times 10^{-5}, \log 2 = 0.3\right)$

A. degree of dissociation of NH_3 approaches to zero.

B. change in pH would be 1.85

C. concentration of $\left[Na^+\right] = 0.1M, \left[NH_3\right] = 0.1M,$ $\left[OH^-\right] = 0.2M$

D. on addition of OH^-,K_b of NH_3 does not changes

Answer: C

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14. Hydrolysis of sodium acetate will give

A. Acidic solution

B. Basic solution

C. Neutral solution

D. Normal solution

Answer: B

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15. From separate solutions of sodium salts, NaW, NaX, NaY and NaZ have $pH 7.0$, 9.0, 10.0 and 11.0 respectively. When each solution was $0.1M$, the strongest acid is:

A. HW

B. HX

C. HY

D. HZ

Answer: A

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16. Which is the correct alternate for hydrolysis constant of NH_4CN?

A. $\sqrt{\dfrac{K_w}{K_a}}$

B. $\dfrac{K_w}{K_a \times K_b}$

C. $\sqrt{\frac{K_b}{c}}$

D. $\frac{K_a}{K_b}$

Answer: B

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17. Which one of the following salt is most acidic in water?

A. $NiCl_2$

B. $BeCl_2$

C. $FeCl_3$

D. $AlCl_3$

Answer: D

Watch Video Solution

18. Which of the following aqueous solution will have a pH less than `7.0 ?

A. KNO_3

B. $NaOH$

C. $FeCl_3$

D. $NaCN$

Answer: C

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19. Hydrolysis constant for a salt of weak acid and weak base would be

A. $K_h = \frac{K_w}{K_a}$

B. $K_h = \frac{K_w}{K_b}$

C. $K_h = \frac{K_w}{K_a K_b}$

D. None of these

Answer: C

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20. Which of salt will give basic solution on hydrolysis?

A. KCN

B. KCl

C. NH_4Cl

D. CH_3COONH_4

Answer: A

Watch Video Solution

21. Which salt can be classified as an acid salt?

A. Na_2SO_4

B. $BiOCl$

C. $Pb(OH)Cl$

D. Na_2HPO_4

Answer: D

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22. HA is a weak acid and BOH is a weak base. For which of the following salts the extent of hydrolysis is independent of the concentration of the salt in its aqueous solution

A. NaA

B. NaB

C. BCl

D. BA

Answer: D

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23. pH of water is 7. When a substance Y is dissolved in water, the pH becomes 13. The substance Y is a salt of

A. Strong acid and strong base

B. Weak acid and weak base

C. Strong acid and weak base

D. Weak acid and strong base

Answer: D

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24. Which is a basic salt

A. PbS

B. $PbCO_3$

C. $PbSO_4$

D. $2PbCO_3, Pb(OH)_2$

Answer: D

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25. The pH of $0.02 M NH_4Cl(aq)(pK_b = 4.73)$ is equal to

A. 3.78

B. 4.73

C. 5.48

D. 7.00

Answer: C

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26. $100ml$ of $0.1MCH_3COOH$ are mixed with $100ml$ of $0.1MNaOH$, the pH of the resulting solution would be

A. zero

B. 7

C. >7

D. <7

Answer: C

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27. A compound whose aqueous solution will have the highest pH

A. $NaCl$

B. Na_2CO_3

C. NH_4Cl

D. $NaHCO_3$

Answer: B

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28. Baking soda is

A. Basic salt

B. Acidic salt

C. Complex salt

D. Double salt

Answer: B

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29. Which one of the following substances will be a mixed salt?

A. $NaHCO_3$

B. $Ca(OCl)Cl$

C. $K_2SO_4Al_2(SO_4)_3.24H_2O$

D. $Mg(OH)Br$

Answer: B

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30. $0.5M$ ammonium benzoate is hydrolysed to 0.25 precent, hence its hydrolysis constant is

A. 2.5×10^{-5}

B. 1.5×10^{-4}

C. 3.125×10^{-6}

D. 6.25×10^{-4}

Answer: C

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31. The compound whose $0.1M$ solution is basic is

A. Ammonium acetate

B. Calcium carbonate

C. Ammonium sulphate

D. Sodium acetate

Answer: D

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32. A weak base, B, has basicity constant $K_b = 2 \times 10^{-5}$.

The pH of any solution in which $[B] = [BH^+]$ is

A. 4.7

B. 7.0

C. 9.3

D. 9.7

Answer: C

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33. Which of the following will not be hydrolysed?

A. Potassium nitrate

B. Potassium cyanide

C. Potassium succinate

D. Potassium carbonate

Answer: A

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34. In hydrolysis of a salt of weak acid and strong base, $A^{-} + H_2O \Leftrightarrow HA + OH^{-}$, the hydrolysis constant (K_h) is equal to

A. $\frac{K_w}{K_a}$

B. $\frac{K_w}{K_b}$

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

D. $\frac{K_w}{K_a \times K_b}$

Answer: A

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35. Which of the following $0.1M$ solution will contain the largest concentration of hydronium ions?

A. $NaHCO_3$

B. NH_4Cl

C. HCl

D. NH_3

Answer: C

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36. $1MNaCl$ and $1MHCl$ are present in an aqueous solution. The solution is

A. Not a buffer solution and with $pH < 7$

B. Not a buffer solution with $pH > 7$

C. A buffer solution with $pH < 7$

D. A buffer solution with $pH > 7$

Answer: A

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Common Ion Effect, Ksp And Applications

1. The solubility of A_2X_5 is x mole dm^{-3}. Its solubility product is

A. $36x^6$

B. $64 \times 10^4 x^7$

C. $126x^7$

D. $1.25 \times 10^4 x^7$

Answer: D

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

$\left(K_{sp} = 1.8 \times 10^{-10}\right)$ 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. $10^{-6} M, Ag^{+}$ and $10^{-6} M, Cl^{-}$

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

Answer: A

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3. 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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4. The solubility of $CaF_2(K_{sp} = 3.4 \times 10^{-11})$ in $0.1M$ solution of NaF would be

A. $3.4 \times 10^{-12}M$

B. $3.4 \times 10^{-10}M$

C. $3.4 \times 10^{-9}M$

D. $3.4 \times 10^{-13}M$

Answer: C

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5. Let the solubilities of $AgCI$ in H_2O, and in $0.01MCaCI_2, 0.01MNaCI,$ and $0.05MAgNO_3$ be $S_1, S_2, S_3, S_4,$ respectively. What is the correct relationship between these quantites.

A. $s_1 > s_2 > s_3 > s_4$

B. $s_1 > s_2 = s_3 > s_4$

C. $s_1 > s_3 > s_2 > s_4$

D. $s_4 > s_2 > s_3 > s_1$

Answer: C

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6. Which of the following statements is correct for a solution saturated with $AgCl$ and $AgBr$ if their solubilities in moles per litre in separate solutions are x and y respectively?

A. $\left[Ag^{+}\right] = x + y$

B. $\left[Ag^{+}\right] = \left[Br^{-}\right] + \left[Cl^{-}\right]$

C. $\left[Br^{-}\right] = y$

D. $\left[Cl^{-}\right]$

Answer: B

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

A. $MnS(K_{SP} = 8 \times \ - 37)$

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

C. $Bi_2S_3\left(K_{SP} = \ \times 10^{-70}\right)$

D. $Ag_2S\left(K_{SP} = 6 \times 10^{-5}\right)$

Answer: B

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8. Solubility of BaF_2 in a solution of $Ba(NO_3)_2$, will be represented by the concentration term:

A. $\left[Ba^{2+}\right]$

B. $\left[F^{-}\right]$

C. $1/2\left[F^{-}\right]$

D. $2\left[NO_3^{+}\right]$

Answer: C

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9. At $30^{\circ}C$ the solubility of $Ag_2CO_3\left(K_{SP}=8\times10^{-12}\right)$ would be gretest in one litre of:

A. $0.05MNa_2CO_3$

B. $0.05MAgNO_3$

C. pure water

D. $0.05MK_2CO_3$

Answer: C

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10. The volume of the water needed to dissolve $1g$ of $BaSO_4\left(K_{SP} = 1.1 \times 10^{-10}\right)$ at $25^\circ C$ is:

A. $280 litre$

B. $410 litre$

C. $205 litre$

D. None of these

Answer: B

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11. A solution of Na_2CO_3 is added drop by drop to litre of a solution containing 10^{-4} mole of Ba^{2+} and 10^{-5} mole of Ag, if K_{SP} for $BaCO_3$ is 8.1×10^{-9} and K_{SP} for $Ag_2CO_3 is 6.9 \times 10^{-12}$, then which is not true ?

A. No precipitate of $BaCO_3$ will appear until $\left[CO_3^{2-}\right]$ reaches $8.1 \times 10^{-5} mol per litre$

B. A percipitate of Ag_2CO_3 will appear when $\left[CO_3^{2-}\right]$ reaches $6.9 \times 10^{-5} mol litre^{-1}$

C. No percipitate of Ag_2CO_3 will appear until $\left[CO_3^{2-}\right]$ reaches $6.9 \times 10^{-2} mo \leq per litre$

D. $BaCO_3$ will be percipitated first

Answer: B

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12. $M(OH)_X$ has $K_{SP} 4 \times 10^{-12}$ and solubility $10^{-4} M$.

The value of x is:

A. 1

B. 2

C. 3

D. 4

Answer: B

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13. The solubility products of MA, MB, MC and MD are 1.8×10^{-10}, 4×10^{-3}, 4×10^{-8} and 6×10^{-5} respectively. If a $0.01M$ solution of MX is added dropwise to a mixture containing A^{-}, B^{-}, C^{-} and D^{-} ions, then the one to be precipitated first will be:

A. MA

B. MB

C. MC

D. MD

Answer: A

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14. Which of the following species is more soluble in water ?

A. $M(OH)_3(K_{SP} = 1 \times 10^{-35})$

B. $M(OH)_2(K_{SP} = 1 \times 10^{-30})$

C. $MOH(K_{SP} = 1 \times 10^{-28})$

D. $MOH(K_{SP} = 1 \times 10^{-26})$

Answer: A

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15. Silver nitrate solution is gradually added to an aqueous solution containing 0.01 M each of chloride, bromide and iodine ions. The correct sequence in which the halides will be precipitated is :

A. Bromide, chloride iodide

B. Iodide, chloride, bormide

C. Iodide, bormide, chloride

D. Bromide chloride

Answer: C

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16. K_{sp} of SrF_2 (s) in water is 3.2×10^{-11}. The solubility SrF_2 (s) in $0.1(M)NaCl$ solution is

A. $3.2 \times 10^{-9}(M)$

B. $2 \times 10^{-4}(M)$

C. $4 \times 10^{-4}(M)$

D. slightly higher than $2 \times 10^{-4}(M)$

Answer: D

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17. Sodium chromate solution is gradually added to a mixture containing $0.05 M Pb^{2+}$ ions and $0.10 M Ba^{2+}$ ions. The concentration of the ion precipitating first when the second ion begins to form a percipitate is [Note: K_{sp} of $BaCrO_4 = 2.4 \times 10^{-10}$ and K_{sp} of $PbCrO_4 = 1.8 \times 10^{-14}$]

A. 7.5×10^{-6}

B. 2.5×10^{-5}

C. 8.2×10^{-3}

D. 5.0×10^{-4}

Answer: A

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18. Solubility of calcium phosphate (molecular mass, M) in water is Wg per $100mL$ at $25^\circ C$. Its solubility product at $25^\circ C$ will be approximately

A. $10^9\left(\frac{W}{M}\right)^5$

B. $10^7\left(\frac{W}{M}\right)^5$

C. $10^5\left(\frac{W}{M}\right)^5$

D. $10^3\left(\frac{W}{M}\right)^5$

Answer: B

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19. The K_{sp} of $Mg(OH)_2$ is 1×10^{-12}. $0.01 M Mg(OH)_2$ will precipitate at the limiting pH

A. 3

B. 9

C. 5

D. 8

Answer: B

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20. A salt M_2X_3 dissolves in water such that is solubility is $x.\ g.\ \text{mole}/litre$. Its K_{SP} is:

A. x^5

B. $6x^2$

C. $108x^5$

D. $6x^5$

Answer: C

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21. Solubility product of $AgCl$ is 2.8×10^{-10} at $25^{\circ} C$. Calculate solubility of the salt in $0.1 M AgNO_3$ solution

A. $2.8 \times 10^{-9} mol / litre$

B. $2.8 \times 10^{-10} mol / litre$

C. $3.2 \times 10^{-9} mol / litre$

D. $3.2 \times 10^{-12} mol / litre$

Answer: A

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22. The solubility product of chalk is 9.3×10^{-8}. Calculate its solubility in gram per litre

A. $0.3040 gram / litre$

B. $0.0304 gram / litre$

C. $2.0304 gram / litre$

D. $4.0304 gram / litre$

Answer: B

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23. A solution containing NH_4Cl and NH_4OH has $[OH] = 10^{-6} mol L^{-1}$, which of the following hydroxides would be precipitated when this solution in added in equal volume to a solution containing $0.1M$ of metal ions?

A. $Mg(OH)_2(K_{sp} = 3 \times 10^{-11})$

B. $Fe(OH)_2(K_{sp} = 8 \times 10^{-16})$

C. $Cd(OH)_2(K_{sp} = 8 \times 10^{-6})$

D. $AgOH(K_{sp} = 5 \times 10^{-3})$

Answer: B

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24. The precipitate of $CaF_2(K_{sp} = 1.7 \times 10^{-10})$ is obtained when equal volumes of the following are mixed

A. $10^{-4} MCa^{2+} ion$ and $10^{-4} MF^{-}$

B. $10^{-2} MCa^{2+}$ and $10^{-3} MF^{-}$

C. $10^{-5} MCa^{2+}$ and $10^{-3} MF^{-}$

D. $10^{-3} MCa^{2+}$ and $10^{-5} MF^{-}$

Answer: B

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25. K_{sp} of a sparingly soluble salt AB_2 is $4 \times 10^{-12} mol^3 L^{-3}$. The solubility of the salt is

A. $2 \times 10^{-6} M$

B. $4 \times 10^{-4} M$

C. $1 \times 10^{-12} M$

D. $1 \times 10^{-4} M$

Answer: D

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26. If the solubility product of MOH is $1 \times 10^{-10} mol^2 dm^{-6}$ then pH of its aqueous solution will be

A. 12

B. 9

C. 6

D. 3

Answer: B

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27. The solubility product of $AgCl$ is 1.8×10^{-10} at $18^{\circ} C$. The solubility of $AgCl$ in $0.1M$ solution of sodium chloride would be

A. $1.8 \times 10^{-9} M$

B. $1.8 \times 10^{-10} M$

C. $1.8 \times 10^{-11} M$

D. $4.2 \times 10^{-5} M$

Answer: A

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28. Three sparingly soluble salts M_2X, MX and MX_3 have the same solubility product. Their solubilities will be in the order

A. $MX_3 > MX > M_2X$

B. $MX_3 > M_2X > MX$

C. $MX > MX_3 > M_2X$

D. $MX > M_2X > MX_3$

Answer: D

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29. The solubility of a sparingly soluble compound MX_2 at $25^\circ C$ is $5.0 \times 10^{-3} mol / L$. Its solubility product at that temperature is

A. 25×10^{-6}

B. 5.0×10^{-11}

C. 5.0×10^{-7}

D. 1.25×10^{-9}

Answer: C

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30. The solubility product (K_{sp}) of the sparingly soluble salt MX at $25^{\circ} C$ is 2.5×10^{-9}. The solubility of the salt (in $mol L^{-1}$) at this temperature is

A. 1.0×10^{-14}

B. 5.0×10^{-8}

C. 1.25×10^{-9}

D. 5.0×10^{-5}

Answer: D

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31. The solubility of a springly soluble salt AB_2 in water is $1.0 \times 10^{-5} mol L^{-1}$. Its solubility product is:

A. 10^{-15}

B. 10^{-10}

C. 4×10^{-15}

D. 4×10^{-10}

Answer: C

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32. K_{SP} of MX_4 and solubility of MX_4 is $S mol / L$ is related by:

A. $S = [K_{SP} / 256]^{1/5}$

B. $S = [128 K_{SP}]^{1/4}$

C. $S = [256 K_{SP}]^{1/5}$

D. $S = [K_{SP} / 128]^{1/4}$

Answer: A

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33. The solubility product of a salt having general formula MX_2 in water is 4×10^{-12}. The concentration of $M^{2+} ions$ in the aqueous solution of the salt is:

A. $2 \times 10^{-6} M$

B. $1 \times 10^{-4} M$

C. $1.6 \times 10^{-4} M$

D. $4.0 \times 10^{-6} M$

Answer: B

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34. In a saturated solution of the spatingly soluble strong electrolyte $AgIO_3$ (molecular mass $= 283$) the equilibrium which sets in is

$AgIO_3(s) \Leftrightarrow Ag^+(aq) + IO_3^-(aq)$

If the solubility product constant K_{SP} of $AgIO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ cotained in $100 mL$ of its saturated solution?

A. $28.3 \times 10^{-2} g$

B. $28.3 \times 10^{-3} g$

C. $1.0 \times 10^{-7} g$

D. $1.0 \times 10^{-4} g$

Answer: B

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35. The K_{SP} for $Cr(OH)_3$ is 1.6×10^{-30}. The molar solubility of this compound in water is

A. $2\sqrt{1.6 \times 10^{-30}}$

B. $4\sqrt{1.6 \times 10^{-30}}$

C. $4\sqrt{\frac{1.6 \times 10^{-30}}{27}}$

D. $1.6 \times 10^{-30} / 27$

Answer: C

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36. Solubility product of silver bromide is 5.0×10^{-13}. The quantity of potassium bromide (molar mass taken as $120 gmol^{-1}$) to be added to $1L$ of $0.05M$ solution of silver nitrate to start the precipitation of $AgBr$ is

A. $1.2 \times 10^{-10} g$

B. $1.2 \times 10^{-9} g$

C. $6.2 \times 10^{-5} g$

D. $5.0 \times 10^{-8} g$

Answer: B

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37. At $25^{\circ}C$, the solubility product of $Mg(OH)_2$ is 1.0×10^{-11}. At which pH, will Mg^{2+} ions start precipitating in the form of $Mg(OH)_2$ from a solution of $0.001 M Mg^{2+}$ ions ?

A. 9

B. 10

C. 11

D. 8

Answer: B

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38. Solid $Ba(NO_3)$ is gradually dissolved in a $1.0 \times 10^{-4} M Na_2CO_3$ solution. At what concentrations of Ba^{2+}, will a precipitate begin to form?

(K_{SP} for $BaCO_3 = 5.1 \times 10^{-9}$)

A. $4.1 \times 10^{-5} M$

B. $5.1 \times 10^{-5} M$

C. $8.1 \times 10^{-8} M$

D. $8.1 \times 10^{-7} M$

Answer: B

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1. When a solution of benzoic acid was titrated with $NaOH$ the pH of the solution when half the acid neutralized was 4.2. Dissociation constant of the acid is

A. 6.31×10^{-5}

B. 3.2×10^{-5}

C. 8.7×10^{-8}

D. 6.42×10^{-4}

Answer: A

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2. Which is a buffer solution?

A. $CH_3COOH + CH_3COONa$

B. $CH_3COOH + CH_3COONH_4$

C. $CH_3COOH + NH_4Cl$

D. $NaOH + NaCl$

Answer: A

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3. The pH of a buffer is 6.745. When 0.01 mole of $NaOH$ is added to 1 litre of it, the pH changes to 6.832. Its buffer capacity is

A. 0.187

B. 0.115

C. 0.076

D. 0.896

Answer: B

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4. A buffer solution contains 1 mole of $(NH_4)_2SO_4$ and 1 mole of $NH_4OH\left(K_b = 10^{-5}\right)$. The pH of solution will be:

A. 5

B. 9

C. 5.3

D. 8.7

Answer: D

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5. For preparing a buffer solution of $pH6$ by mixing sodium accetate and acetic, the ratio of the concentration of salt and acid should be $(K_a = 10^{-5})$

A. $1:10$

B. $10:1$

C. $100:1$

D. $1:100$

Answer: B

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6. 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. zero

Answer: A

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7. Which may be added to one litre of water to act a buffer?

A. One mole of CH_3COOH and one mole of HCl

B. One mole of NH_4OH and one mole of $NaOH$

C. One mole of NH_4Cl and one mole of HCl

D. One mole of CH_3COOH and 0.5 mole of $NaOH$

Answer: D

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8. pH of a solution of $10ml.\ 1N$ sodium acetate and $50ml 2N$ acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$ is approximately

A. 4

B. 5

C. 6

D. 7

Answer: A

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9. The pH of an acidic buffer mixture is:

A. > 7

B. < 7

C. $= 7$

D. Depends upon K_a of acids

Answer: D

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10. pH of a mixture containing $0.10 M X^-$ and $0.20 M HX$ is: $\left[pK_b\left(X^-\right) = 4\right]$

A. $4 + \log 2$

B. $4 - \log 2$

C. $10 + \log 2$

D. $10 - \log 2$

Answer: D

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11. What $\%$ of the carbon in the $H_2CO_3 - HCO_3^-$ buffer should be in the form of HCO_3^- so as to have a neutral solution? $\left(K_a = 4 \times 10^{-7}\right)$

A. $20\ \%$

B. $40\ \%$

C. $60\ \%$

D. $80\ \%$

Answer: D

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12. An acidic buffer solution can be prepared by mixing solution of

A. Ammonium acetate and acetic acid

B. Ammonium chloride and hydrochloric acid

C. Sulphuric acid and sodium sulphate

D. Acetic acid and sulphuric acid

Answer: A

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13. Buffer capacity of a buffer solution is x, the volume of $1 M NaOH$ added to $100 mL$ of this solution if the change of pH by 1 is

A. $0.1xmL$

B. $10xmL$

C. $100xmL$

D. xmL

Answer: C

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14. $100mL$ of a buffer solution contains $0.1M$ each of weak acid HA and salt NaA. How many gram of $NaOH$ should be added to the buffer so that it pH will be 6 ?

(K_a of $HA = 10^{-5}$).

A. 4.19

B. 0458

C. 0.328

D. None

Answer: C

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15. Calculate the amount of $(NH_4)_2SO_4$ in grams which must be added to $500ml$ of $0.2MNH_3$ to yield a solution of $pH = 9$, K_b for $NH_3 = 2 \times 10^{-5}$

A. $3.248g$

B. $4.248g$

C. $1.320g$

D. $6.248g$

Answer: C

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16. The buffer solution of $100ml$ having a pH value 4 when added to $1ml$ dilute HCl, then the pH of buffer solution

A. Converts to 7

B. Does not change

C. Converts to 2

D. Changes to 10

Answer: B

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17. What amount of solution propanoate should be added to one litre of an aqueous solution containing 0.02 mole of propanoic acid ($K_a = 1.0 \times 10^{-5}$ at $25^{\circ} C$) to obtain a buffer solution of $pH6$

A. $0.1M$

B. $0.2M$

C. $0.3M$

D. $1.3M$

Answer: B

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18. $20ml$ of $0.2MNaOH$ is added to $50ml$, of $0.2MCH_3COOH$ to give $70ml$, of the solution. What is the pH of the solution? The ionization constant of acetic acid is 2×10^{-5}

A. 4.522

B. 5.568

C. 6.522

D. 7.568

Answer: A

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19. The concentration of H^{+} ion in a $0.2M$ solution of $HCOOH$ is $6.4 \times 10^{-3} \text{mole} L^{-1}$. To this solution $HCOONa$ is added so as to adjust the concentration of $HCOONa$ to one mole per litre. What will be the pH of this solution? K_a for $HCOOH$ is 2.4×10^{-4} and the degree of dissociation of $HCOONa$ is 0.75

A. 3.19

B. 4.19

C. 5.19

D. 6.19

Answer: B

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20. What amount of HCl will be required to prepare one litre of a buffer solution of $pH 10.4$ using 0.01 mole of $NaCN$? Given $K_{ion}(HCN) = 4.1 \times 10^{-10}$.

A. 8.55×10^{-3} moles

B. 8.65×10^{-3} moles

C. 8.75×10^{-3} moles

D. 9.9×10^{-4} moles

Answer: D

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21. Calculate pH of a solution of given mixture ($0.1\text{mol}\ CH_3COOH + 0.2molCH_3COONa$) in $100ml$ of mixture. $K = 2 \times 10^{-5}$.

A. 4.6

B. 5.6

C. 6.6

D. 7.6

Answer: A

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22. Calculate the pH of a buffer solution prepared by dissolving $10.6g$ of Na_2CO_3 in $500ml$ of an aqueous solution containing $80ml$ of $1MHCl$. K_a for $HCO_3^- = 6 \times 10^{-11}$

A. 8.6

B. 9.6

C. 11.6

D. 12.6

Answer: B

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23. What volume of $0.1 M HCOONa$ solution should be added to $50 ml$ of $0.05 M$ formic acid to produce a buffer solution of $pH = 4.0, pK_a$ of formic acid $= 3.7$?

A. $50 ml$

B. $40 ml$

C. $30 ml$

D. $60 ml$

Answer: A

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24. 0.1 mole of $CH_3NH_2(K_b = 5 \times 10^{-4})$ is mixed with 0.08 mole of HCl and diluted to one liter. The $[H^+]$ in solution is

A. $8 \times 10^{-2} M$

B. $8 \times 10^{-11} M$

C. $1.6 \times 10^{-11} M$

D. $8 \times 10^{-5} M$

Answer: B

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25. The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA in which 50% of the acid is ionized is:

A. 4.5

B. 2.5

C. 9.5

D. 7.0

Answer: C

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Indicators

1. A volume of $50.00 mL$ of a weak acid of unknown concentration is titrated with $0.10 M$ solution of $NaOH$. The equivalence point is reached after $39.30 mL$ of $NaOH$ solution has been added. At the half-equivalence point $(19.65 mL)$, the pH is 4.85. Thus, initial concentration of the acid and its pK_a values are

A. $[HA]$ initial $= 0.1 M, pK_a = 4.85$

B. $[HA]$ initial $= 0.079 M, pK_a = 2.93$

C. $[HA]$ initial $= 0.1 M, pK_a = 3.70$

D. $[HA]$ initial $= 0.079 M, pK_a = 4.85$

Answer: D

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2. What fraction of an indicator $H\text{in}$ is in the basic form at a pH of 6 if pK_a of the indicator is 5?

A. $\frac{1}{2}$

B. $\frac{1}{11}$

C. $\frac{10}{11}$

D. $\frac{1}{10}$

Answer: C

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3. Strong acids are generally used as standard solution in acid-base titrations because:

A. The pH at equivalence point will be 7

B. They titrate both strong and weak base

C. They form more stable solutions than weak acids

D. The salts of strong acids do not hydrolyse

Answer: B

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4. At $25^{\circ} CpH$ range of phenolphthalein is $8-10.$ At $100^{\circ} CpH$ range of phenophthalein would be

A. pH range remains unaffected by the temperature

B. pH range is altered to 8 to 9

C. pH range is altered to 7 to 11

D. pH range is altered to 8 to 11

Answer: B

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5. An indicator is a weak acid and pH range of its colour is 3 to 5. If the neutral point of the indicator lies in the centre of the $[H^+]$ corresponding to given pH range, then pH at the equivalence point is

A. 7.0

B. 4.0

C. 3.3

D. 5.0

Answer: C

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6. $100mL$ 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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7. What will be the pH at the equivalence point during the titration of a $100mL 0.2M$ solution of $CH_3\mathbb{C}ONa$ with $0.2M$ solution of HCl? $K_a = 2 \times 10^{-5}$

A. $3 - \log\sqrt{2}$

B. $3 + \log\sqrt{2}$

C. $3 - \log 2$

D. $3 + \log 2$

Answer: A

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8. $20mL$ of a weak monobasic acid (HA) requires $20mL0.2MNaOH$ for complete titration. If pH of solution upon addition of $10mL$ of this alkali to $25mL$ of the above solution of HA is 5.8. The pK_a of the weak acid is

A. 6.1

B. 5.8

C. 5.98

D. 5.58

Answer: C

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9. 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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10. When $10ml$ of $0.1M$ acetic acid $(pK_a = 50)$ is titrated against $10ml$ of $0.1M$ ammonia solution $(pK_b = 5.0)$, the equivalence point occurs at pH

A. 5.0

B. 6.0

C. 7.0

D. 9.0

Answer: C

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11. An indicator has $pK_{In} = 5.3$. In a certain titration, this indicator is found to be 80% ionized in its acid form. Thus,

pH of the solution is

A. 4.7

B. 5.3

C. 5.9

D. 6.2

Answer: A

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12. A certain indicator (an organic dye) has $pK_a = 5$. For which of the following titrations may it be suitable

A. acetic acid against $NaOH$

B. aniline hydrochloride against $NaOH$

C. sodium carbonate against HCl

D. barium hydroxide against oxalic acid

Answer: C

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13. An acid-base indicator which is a weak acid has a pK_a value $= 5.5$. At what concentration ratio of sodium acetate to acetic acid would the indicator show a colour half-way between those of its acid and conjugate base forms?

A. $4.93 : 1$

B. $6.3 : 1$

C. $5.62 : 1$

D. $2.37 : 1$

Answer: C

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14. K_b of an acid-base indicator H In is 10^{-9}. The pH at which its $10^{-3}(M)$ solution shows the colour change

A. 9

B. 7

C. 5

D. 3

Answer: C

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15. A certain mixture of HCl and $CH_3 - COOH$ is $0.1M$ in each of the acids. $20ml$ of this solution is titrated against $0.1MNaOH$. By how many units does the pH change from the start to the stage when the HCl is almost completely neutralised and acidic acid remains unreacted? K_a for acetic acid $= 2 \times 10^{-5}$.

A. 1.5

B. 3

C. 2

D. 3.25

Answer: B

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16. A weak acid (HA) after treatment with $12mL$ of $0.1M$ strong base (BOH) has a pH of 5. At the end point , the volume of same base required is $27mL$. K_a of acid is $(\log 2 = 0.3)$

A. 1.8×10^{-5}

B. 8×10^{-6}

C. 1.8×10^{-6}

D. 8×10^{-5}

Answer: B

17. To a $200ml$ of $0.1M$ weak aicd HA solution $90ml$ of $0.1M$ solution of $NaOH$ be added. Now, what volume of $0.1MNaOH$ be added into above solution so that pH of resulting solution be 5. $\left[K_a(HA) = 10^{-5}\right]$

A. $2ml$

B. $20ml$

C. $10ml$

D. $15ml$

Answer: C

18. What is the difference in pH for $1/3$ and $2/3$ stages of neutralization of $0.1MCH_3COOH$ with $0.1MNaOH$?

A. $2\log 3$

B. $2\log(1/4)$

C. $2\log(2/3)$

D. $2\log 2$

Answer: D

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Section B - Assertion Reasoning

1. Assertion : A ionic product is used for any types of electrolytes whereas solubility product is applicable only to sparingly soluble salts.

Reason : ionic product is definef at any stage of the reaction whereas solubility product is only applicable to the saturation stage

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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2. Assertion : The pH of pure water is less than 7 at $60^\circ C$.

Reason : As the temperature increases, pure water becomes slightly acidic.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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3. Assertion : The pH of human blood at body temperature is found to be 6.9.

Reason : Blood is alkaline in nature.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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4. Assertion : The pH of a basic buffer mixture is given by:

$$pH = pK_a + \log\left(\frac{[Base]}{[conjugateacid]}\right)$$

Reason : The pH of an acidic buffer mixture is given by:

$$pH = pK_a + \log\left(\frac{[conjugateacid]}{[Acid]}\right)$$

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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5. Assertion : On passing $HCl(g)$ through a saturted solution of $BaCl_2$, a white turbidity appears.

Reason : The common ion effect is responsible for white turbidity.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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6. Assertion : Degree of hydrolysis and pH of a salt, e.g. NH_4CN is independent of concentration of NH_4CN

Reason : The solution of NH_4CN in water has pH slightly greater than 7.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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7. Assertion : In a pair of two electrolytes one having higher value of K_{SP} is more soluble in water than the other having lower value of K_{sp}.

Reason : Solubility of electrolyte depends upon K_{sp} as well as on the nature of electrolyte.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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8. Assertion : $HgCl_2$ and $SnCl_2$ cannot coexist in a solution.

Reason : Increase in concentration of Cl^- in solution brings in precipitation of either of them.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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9. Assertion : The solubility of HgI_2 in water decreases in presence of KI.

Reason : HgI_2 is insoluble in water but it becomes soluble in $KI(aq)$.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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10. Assertion : The dissociation constant of water at $60^{\circ} C$ is 10^{-13}.

Reason : The pH of water is 6.5 and that it behaves as acid at $60^{\circ} C$.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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11. Assertion : Salting out action of sodium soap in oresence of $NaCl$ is based on common ion effect.

Reason : Salting out action of soap is based on the fact that as the concentration of Na^{+} increases, the $RCOONa$ shows precipitation because $[RCOO^{-}][Na^{+}] > K_{sp}$.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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

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

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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13. 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 assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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14. Assertion : The H_3O^+ has additional water molecules closely associated with it.

Reason : In solid state the species $H_5O_2^+$ and $H_9O_4^+$ have been found to exist.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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15. Assertion : The proton transfer reaction between NH_3 and H_2O proceeds only to a slight extent.

Reason : Proton transfer reaction is virtually complete in the case of HCl in dilute solution.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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16. Assertion : Aqueoous solutions of all strong acids contain only the same acid, the hydronium ion.

Reason : Hydronium ion is the strongest acid that can exist in any significant concentration in dilute aqueous solution.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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17. Assertion : Acids that have more than one proton that can be donated to base are called polyrotic acids.

Reason : For all diprotic acids, the equilibrium constant K_{a2} for the second stage of ionisation is smaller than the equilibrium constant, K_{a_1}, for the first stage of ionisation.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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18. Assertion : $0.20M$ solution of $NaCN$ is more than basic than $0.20M$ solution of NaF.

Reason : K_a of HCN is very much less than that of HF.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Assertion is false but reason is true.

Answer: A

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19. Assertion : A substance that can either act as an acid a base is called ampholyte.

Reason : Bisulphide ion (HS^{-}) and biscarbonate ion (HCO_3^{-}) are ampholytes.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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20. Assertion : Addition of $HCl(aq)$ to $HCOOH(aq)$ decreases the ionization of $HCOOH(aq)$

Reason : Due to common ion effect of H^{+}, ionization of $HCOOH$ decreased.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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21. Assertion : pH of $10^{-7} MHCl$ is less than 7 at $25^{\circ} C$.

Reason : At very low concentration of HCl, contribution of `H^(+) from water is considerble.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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AIPMT/ NEET/ AIIMS Questions

1. In $HS^{-}, I^{-}, R-NH_2, NH_3$ order of proton accepting tendency will be

A. $I_{-} > NH_3 > RNH_2 > HS^{-}$

B. $NH_3 > RNH_2 > HS^{-} > I_{-}$

C. $RNH_2 > NH_3 > HS^{-} > I_{-}$

D. $HS^{-} > RNH_2 > NH_3 > I_{-}$

Answer: C

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2. NH_3 gas dissolves in water to give NH_4OH. In this reaction, water acts as

A. an acid

B. a base

C. a salt

D. a conjugate base

Answer: A

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3. Ionisation constant of CH_3COOH is 1.7×10^{-5} and concentration of $H^+ ions$ is 3.4×10^{-4}. Then, find out initial concentration of CH_3COOH molecules.

A. 3.4×10^{-4}

B. 3.4×10^{-3}

C. 6.8×10^{-4}

D. 6.8×10^{-3}

Answer: D

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4. Solubility if M_2S type salt is 3.5×10^{-6}, then find out its solubility product

A. 1.7×10^{-6}

B. 1.7×10^{-16}

C. 1.7×10^{-18}

D. 1.7×10^{-12}

Answer: B

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5. Solubility of MX_2 type electrolytes is $0.5 \times 10^{-4} mol / L$, then find out K_{sp} of electrolytes.

A. 5×10^{-12}

B. 25×10^{-10}

C. 1×10^{-13}

D. 5×10^{-13}

Answer: D

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6. Which has the highest pH?

A. CH_3COOK

B. Na_2CO_3

C. NH_4Cl

D. $NaNO_3$

Answer: B

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7. Solution of $0.1 N NH_4OH$ and $0.1 N NH_4Cl$ has $pH 9.25$, then find out K_b of NH_4OH.

A. 9.25

B. 4.75

C. 3.75

D. 8.25

Answer: B

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8. The solubility product of AgI at $25^{\circ}C$ is $1.0 \times 10^{-16} mol^2 L^{-2}$. The solubility of AgI in $10^{-4} N$ solution of KI at $25^{\circ}C$ is approximately (in $mol L^{-1}$)

A. 1.0×10^{-10}

B. 1.0×10^{-8}

C. 1.0×10^{-16}

D. 1.0×10^{-12}

Answer: D

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9. The rapid change of pH near the stoichiometric point of an acid-base titration is the basic of indicator detection. pH of the solution is related to the ratio of the concentration of conjugate acid $(H \in)$ and base $\left(In^{-}\right)$ forms of the indicator by the expression

A. $\log\left[\frac{[In^{-}]}{[HIn]}\right] = pK_a + pH$

B. $\log\left[\frac{[HIn]}{[In^{-}]}\right] = K_a + pH$

C. $\log\left[\frac{[In^{-}]}{[HIn]}\right] = pH + pK_a$

D. $\log\left[\frac{[In^{-}]}{[HIn]}\right] = pH - pK_a$

Answer: D

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10. The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility (in mo/L) is

A. 5.6×10^{-6}

B. 3.1×10^{-4}

C. 2×10^{-4}

D. 4×10^{-4}

Answer: C

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11. The correct relationship between the pH of isomolar solutions of sodium oxide (pH_1), sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH_4) is

A. $pH_1 > pH_2 > pH_3 > pH_4$

B. `pH_(1)ltpH_(2)ltpH_(3)~pH_(4)

C. $pH_1 < pH_2$~$pH_3 > pH_4$

D. $pH_1 > pH_2$~$pH_3 > pH_4$

Answer: A

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12. At $25^\circ C K_b$ for $BOH = 1.0 \times 10^{-12}$.$0.01M$ solution of BOH has $\left[OH^{-}\right]$:

A. $2.0 \times 10^{-6} mol L^{-1}$

B. $1.0 \times 10^{-5} mol L^{-1}$

C. $1.0 \times 10^{-6} mol L^{-1}$

D. $1.0 \times 10^{-7} mol L^{-1}$

Answer: D

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13. H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group in qualitative analysis but not those belonging to the fourth group. It is because

A. the presence of HCl decreases the sulphide ion concentration

B. the presence of HCl increases the sulphide ion concentration

C. the solubility product of group II sulphides is more than that of group IV sulphides

D. The sulphides of group IV cations are unstable in HCl

Answer: A

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14. Which of the following pairs consitutes buffer?

A. HNO_3 and NH_4NO_3

B. HCl and KCl

C. HNO_2 and $NaNO_2$

D. $NaOH$ and $NaCl$

Answer: C

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15. The hydrogen ion concentration of a $10^{-8} MHCl$ aqueous soultion at $298K(K_w = 10^{-14})$ is

A. $1.0 \times 10^{-6} M$

B. $1.0525 \times 10^{-7} M$

C. $9.525 \times 10^{-8} M$

D. $1.0 \times 10^{-8} M$

Answer: B

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16. Calculate the pOH of solution at $25^{\circ} C$ that contains $1 \times 10^{-10} M$ of hydronium ions, i.e., H_3O^{+}

A. 4

B. 9

C. 1

D. 7

Answer: A

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17. A monoprotic acid in $0.1M$ solution has $K_a = 1.0 \times 10^{-5}$. The degree of dissociation for acid is

A. $1.0\,\%$

B. $99.9\,\%$

C. $0.1\,\%$

D. $99\,\%$

Answer: A

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18. Equimolar solution of the following were prepared in water separately. Which one of the solutions will record the highest pH?

A. $BaCl_2$

B. $MgCl_2$

C. $CaCl_2$

D. $SrCl_2$

Answer: A

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

A. $3.7 \times 10^{-4} M$

B. $3.7 \times 10^{-3} M$

C. $1.11 \times 10^{-3} M$

D. $1.11 \times 10^{-4} M$

Answer: A

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20. At temperature T, a compound $AB_2(g)$ dissociates according to the reaction

$2AB_2(g) \Leftrightarrow 2AB(g) + B_2(g)$

with degree of dissociation α, which is small compared with unity. The expression for K_p in terms of α and the total pressure P_T is

A. $(2K_p / p)$

B. $(2K_p / p)^{1/3}$

C. $(2K_p / p)^{1/2}$

D. (K_p / p)

Answer: B

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21. The equilibrium constants K_{p1} and K_{p2} for the reactions X $\Leftrightarrow$ 2Y and Z $\Leftrightarrow$ P + Q, respectively, are in the ratio of $1:9$. If the degree of dissures at these equilibria is:

A. $3:1$

B. $1:9$

C. $36 : 1$

D. $1 : 1$

Answer: C

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22. Which of the following molecules acts as a Lewis acid?

A. $(CH_3)_3N$

B. $(CH_3)_3B$

C. $(CH_3)_2O$

D. $(CH_3)_3P$

Answer: B

Watch Video Solution

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

A. $0.10 M$

B. $0.40 M$

C. $0.0050 M$

D. $0.12 M$

Answer: A

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24. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at $298K$. Hydrolysis constant of ammonium chloride is

A. 5.65×10^{-12}

B. 5.65×10^{-10}

C. 6.50×10^{-12}

D. 5.65×10^{-13}

Answer: B

Watch Video Solution

25. The dissociation constants for acetic acid and HCN at $25^{\circ} C$ are 1.5×10^{-5} and 4.5×10^{-10} , respectively. The equilibrium constant for the equilibirum

$CN^- + CH_3COOH \Leftrightarrow HCN + CH_3COO^-$ would be

A. 3.0×10^4

B. 3.0×10^{-5}

C. 3.0×10^5

D. 3.0×10^{-4}

Answer: A

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26. Which of the following molecular hydride act as a Lewis acid ?

A. NH_3

B. H_2O

C. B_2H_6

D. CH_4

Answer: A

Watch Video Solution

27. Which of the following describes correct sequence for decreasing Lewis acid nature?

A. $BCl_3 > BF_3 > BBr_3$

B. $BBr_3 > BCl_3 > BF_3$

C. $BBr_3 > BF_3 > BCl_3$

D. $BF_3 > BCl_3 > BBr_3$

Answer: B

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28. What is $[H^+]$ in mol/L of a solution that is $0.20M$ in CH_3COONa and $0.1M$ in CH_3COOH? K_a for CH_3COOH is 1.8×10^{-5}?

A. 3.5×10^{-4}

B. 1.1×10^{-5}

C. 1.8×10^{-5}

D. 9.0×10^{-6}

Answer: D

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29. In a buffer solution containing equal concentration of B^{-} and HB, the K_b for B^{-} is 10^{-10}. The pH of buffer solution is

A. 10

B. 7

C. 6

D. 4

Answer: D

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30. A buffer solution is prepared in which the concentration of NH_3 is $0.30M$ and the concentration of NH_4^+ is $0.20M$. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution? ($\log 2.7 = 0.43$)

A. 8.73

B. 9.08

C. 9.43

D. 11.72

Answer: C

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31. Which of the following is least likely to behave as Lewis acid?

A. OH^-

B. H_2O

C. NH_3

D. BF_3

Answer: D

Watch Video Solution

32. Buffer solutions have constant acidity and alkalinity because

A. they have large excess of H^{+} or $OH^{-} ions$

B. they have fixed value of pH

C. these give unionized acid or base on reaction with added acid or alkali

D. acids and alkaliesin these solutions are shielded from attack by other ions

Answer: C

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33. pH of saturated solution of $Ba(OH)_2$ is 12. The value of solubility product (K_{sp}) of $Ba(OH)_2$ is

A. 4.0×10^{-6}

B. 5.0×10^{-6}

C. 3.3×10^{-7}

D. 5.0×10^{-7}

Answer: D

Watch Video Solution

34. Equimolar solutions of the following substances were prepared separately. Which one of these will record the highest pH value?

A. $LiCl$

B. $BeCl_2$

C. $BaCl_2$

D. $AlCl_3$

Answer: C

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35. In which of the following arrangements the given sequence is not strict according to the property indicated against it?

A. $HF < HCl < HBr < HI$: increasing acidic strength

B. $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values

C. $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

D. $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidizing power.

Answer: B

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36. Which of the following strongest acid in the following?

A. $HCIO_3$

B. $HCIO_4$

C. H_2SO_3

D. H_2SO_4

Answer: B

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37. Indentify the correct order of solubility in aqueous medium

A. $ZnS > Na_2S > CuS$

B. $Na_2S > CuS > ZnS$

C. $Na_2 > ZnS > CuS$

D. $CuS > ZnS > Na_2S$

Answer: C

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38. Which of these is least likely to act as Lewis base?

A. F^{-}

B. BF^{3}

C. PF^{3}

D. CO

Answer: B

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39. Which of the following salts will give highest pH in water?

A. KCl

B. $Nacl$

C. Na_2CO_3

D. $CuSO_4$

Answer: C

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40. Using the Gibbs energy change, $\Delta G^\circ = +63.3 kJ$, for the following reaction,

$Ag_2CO_3 \Leftrightarrow 2Ag^+(aq) + CO_3^{2-}$

the K_{sp} of $Ag_2CO_3(s)$ in water at $25^\circ C$ is

$(R = 8.314 JK^{-1} mol^{-1})$

A. 3.2×10^{-26}

B. 8.0×10^{-12}

C. 2.9×10^{-3}

D. 7.9×10^{-2}

Answer: B

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41. Which one of the following pairs of solution is not an acidic buffer?

A. H_2CO_3 and Na_2CO_3

B. H_2PO_4 and Na_2PO_4

C. $HClO_4$ and $NaClO_4$

D. CH_3COOH and CH_3COONa

Answer: C

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

A. 7.0

B. 1.04

C. 12.65

D. 2.0

Answer: C

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43. Concentration of the Ag^{+} ions in a saturated solution of $Ag_2CO_2O_4$ is $2.2 \times 10^{-4} mol L^{-1}$ Solubility product of $Ag_2C_2O_4$ is:

A. 2.66×10^{-12}

B. 4.5×10^{-11}

C. 5.3×10^{-12}

D. 2.42×10^{-8}

Answer: C

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44. The solubility of $BaSO_4$ in water is $2.42 \times 10^{-3} gL^{-1}$ at $298K$. The value of its solubility product (K_{sp}) will be (Given molar mass of $BaSO_4 = 233 gmol^{-1}$)

A. $1.08 \times 10^{-10} mol^2 L^{-2}$

B. $1.08 \times 10^{-12} mol^2 L^{-2}$

C. $1.08 \times 10^{-14} mol^2 L^{-2}$

D. $1.08 \times 10^{-8} mol^2 L^{-2}$

Answer: A

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45. Which of the following is Lewis acid?

A. BF_3

B. Cl^-

C. H_2O

D. NH_3

Answer: A

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46. Solubility product of $BaCl_2$ is 4×10^{-9}. Its solubility in moles//litre would be

A. 1×10^{-3}

B. 1×10^{-9}

C. 4×10^{-27}

D. 1×10^{-27}

Answer: A

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47. 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. 8×10^{-6}

C. 6.4×10^{-5}

D. 6.4×10^{-27}

Answer: A

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48. The solubility of $BaSO_4$ in water is $2.33 \times 10^{-3} g/litre$. Its solubility product will be (molecular weight of $BaSO_4 = 233$)

A. 1×10^{-5}

B. 1×10^{-10}

C. 1×10^{-15}

D. 1×10^{-20}

Answer: B

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49. The precipitation occurs if ionic concentration is

A. less than solubility product

B. more than solubility product

C. equal to solubility product

D. None of these

Answer: B

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50. In the reaction : $H_2S \Leftrightarrow 2H^{+} + S^{--}$, when NH_4OH is added, then

A. S^{2-} is precipitated

B. no action takes place

C. concentration of S^{2-} decreases

D. concentration of S^{2-} increases

Answer: D

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51. Solubilty of a salt M^2X^3 is $Ymoldm^{-3}$. The solubility product of the salt will be

A. $6y^4$

B. $64y^4$

C. $36y^5$

D. $108y^5$

Answer: D

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52. pH value of a solution , whose hydronium ion concentration is a$6.2 \times 10^{-9} mol / l$, is

A. 6.21

B. 7.21

C. 7.75

D. 8.21

Answer: D

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53. Which is a buffer solution?

A. $CH3COOH + CH_3COONa$

B. $CH_3COOH + CH_3COONH_4$

C. $CH_3COOH + NH_4CL$

D. $NaOH + NaCl$

Answer: A

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54. A solution has $pH = 5$, it is diluted 100 times, then it will become

A. neutral

B. basic

C. unaffected

D. more acidic

Answer: A

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55. When $10ml$ of $0.1M$ acitec acid $(pk_a = 5.0)$ is titrated against $10ml$ of $0.1M$ ammonia solution $(pk_b = 5.0)$,the equivalence point occurs at pH

A. 5.0

B. 6.0

C. 7.0

D. 9.0

Answer: C

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56. The pH of solution having $[OH^{-}] = 10^{-7}$ is

A. 7

B. 14

C. zero

D. -7

Answer: A

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57. At $80^{\circ} C$ distilled water has $\left[H_3O^{+}\right]$ concentration equal $'^{+} O1 \times 10^{-6}$ mole $/ litre$. The value of K_w at this temperature will be

A. 1×10^{-6}

B. 1×10^{-9}

C. 1×10^{-12}

D. 1×10^{-15}

Answer: C

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58. A base dissolved in water yields a solution with a hydroxide ion concentration of $0.05 mol litre^{-1}$. The solution is

A. basic

B. acid

C. neutral

D. both (a) and (b)

Answer: A

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59. The pH of 10^{-8} molar aqueous solution of HCl is

A. -8

B. 8

C. $6 > 7$(between 6 and 7)

D. $7 > 8$ (between 7 and 8)

Answer: C

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60. The $H^{+} ion$ concentration is 1.0×10^{-6} mole/litre in solution. Its pH value will be

A. 12

B. 6

C. 18

D. 24

Answer: B

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61. If pH of A, B,C and D are 9.5, 2.5, 3.5 and 5.5 respectively, then strongest acid is

A. A

B. C

C. D

D. B

Answer: D

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62. One weak acid (like CH_3COOH) and its strong base together with salt (like CH_3COONa) is a buffer solution. In which pair this type of characterstic is found?

A. HCl and $NaCl$

B. $NaOH$ and $NaNO_3$

C. KOH and KCl

D. NH_4OH and NH_4Cl

Answer: D

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63. The hydrogen ion concentration of $0.001 M NaOH$ solution is

A. $1 \times 10^{-2} mol / litre$

B. $1 \times 10^{-11} mol / litre$

C. $1 \times 10^{-14} mol / litre$

D. $1 \times 10^{-12} mol / litre$

Answer: B

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64. The strongest Bronsted base in the following anion is

A. ClO^{-}

B. ClO_2^-

C. ClO_3^-

D. ClO_4^-

Answer: A

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65. Which equilibrium can be described as an acid- base reaction using the Lewis acid-base definition but not using the Bronsted-Lowry definition

A. $2NH_3 + H_2SO_4 \Leftrightarrow 2NH_4^+ + SO_4^{2-}$

B. $NH_3 + CH_3COOH \Leftrightarrow NH_4^+ CH_3COO^-$

C. $H_2O + CH_3COOH \Leftrightarrow H_3O^+ + CH_3COO^-$

D.

$$\left[Cu(H_2O)_4\right]^{2+} + 4NH_3 \Leftrightarrow \left[Cu(NH_3)_4\right]^{2+} + 4H_2O$$

Answer: D

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66. The solubility of $CuBr$ is 2×10^{-4} at $25^{\circ} C$. The K_{sp} value for $CuBr$ is

A. $4 \times 10^{-8} mol^2 l^{-2}$

B. $4 \times 10^{-11} mol^2 L^{-1}$

C. $4 \times 10^{-4} mol^2 l^{-2}$

D. $4 \times 10^{-15} mol^2 l^{-2}$

Answer: A

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67. Solubility of $AgCl$ at $20^{\circ}C$ is $1.435 \times 10^{-3} gperlitre.$

The solubility product of $AgCl$ is

A. 1×10^{-5}

B. 1×10^{-10}

C. 1.435×10^{-5}

D. 108×10^{-3}

Answer: B

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68. The pH of a solution at $25^\circ C$ containing $0.10m$ sodium acetate and $0.03m$ acetic acid is (pK_a for $CH_3COOH = 4.57$)

A. 4.09

B. 5.09

C. 6.10

D. 7.09

Answer: B

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69. What is the pH of $0.01M$ glycine solution? For glycine, $K_{a_1} = 4.5 \times 10^{-3}$ and $K_{a_2} = 1.7 \times 10^{-10}$ at $298K$

A. 3.0

B. 10.0

C. 6.1

D. 7.2

Answer: C

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70. At $298K$ a$0.01MCH_3COOH$ solution is 1.34% ionized. The ionization constant K_a for acetic acid will be

A. 1.82×10^{-5}

B. 18.2×10^{-5}

C. 0.182×10^{-5}

D. None of these

Answer: A

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71. Which one of the following is not a buffer solution?

A. $0.8 M H_2S + 0.8 M KHS$

B. $2 M C_6H_5NH_2 + 3 M KHCO_3$

C. $3 M H_2CO_3 + 3 M KHCO_3$

D. $0.05MKClO_4 + 0.05MHClO_4$

Answer: D

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72. When a solution of benzoic acid was titrated with $NaOH$ the pH of the solution when half the acid neutralized was 4.2. Dissociation constant of the acid is

A. 6.31×10^{-5}

B. 3.2×10^{-5}

C. 8.7×10^{-8}

D. 6.42×10^{-4}

Answer: A

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73. Amount of $(NH_4)_2SO_4$ which must be added to $50mL$ of $0.2MNH_4OH$ solution to yield a solution of $pH9.26$ is (pK_b of $NH_4OH = 4.74$)

A. $0.10mol$

B. $0.20mol$

C. $0.05mol$

D. $0.40mol$

Answer: C

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74. When $NH_3(0.1M)50ml$ mix with $HCl(0.1M)10ml$ then what is pH of resultant solution $(pK_b = 4.75)$

A. 9.25

B. 10

C. 9.85

D. 4.15

Answer: C

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75. When $CH_3COOCH_3 + HCl$ is titrated with $NaOH$ then at neutral point the colour of phenopthalein becomes colourless form pink due to:

A. due to formation of CH_3OH

B. due to formation of CH_3COOH which act as a weak acid.

C. Phenolpthalein vaporizes.

D. due to presence of HCl

Answer: B

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76. Which of the following have maximum pH?

A. Black coffee

B. blood

C. Gastric juice

D. Saliva

Answer: B

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77. Assertion: Addition of silver ions to a mixture of aqueous sodium chloride and sodium bromide solution will first precipitate $AgBr$ rather than $AgCl$.

Reason : K_{sp} of $AgCl < K_{sp}$ of $AgBr$.

A. If both the assertion and reason are true and reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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78. Assertion: Heat given out during neutralisation of $NaOH$ and HF is $-13.7kcal/eq$.

Reason : $F^{-} ion$ is more easily hydrated and thus heat of neutralisation of HF and $NaOH$ is more.

A. If both the assertion and reason are true and reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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79. Assertion: $0.1 M NaCN + 0.05 M HCl$ solution on mixing in equal volume forms a buffer solution.

Reason : The solution after mixing contains a weak acid and its conjugate base and thus acts as buffer.

A. If both the assertion and reason are true and reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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80. Assertion: The pH of NH_4OH remains unchanged on addition of NH_4Cl.

Reason : Addition of NH_4Cl suppresses the dissociation of NH_4OH due to common ion effect.

A. If both the assertion and reason are true and reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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Section D - Chapter End Test

1. If the degree of ionization of water be 1.8×10^{-9} at $298K$. Its ionization constant will be

A. 1.8×10^{-16}

B. 1×10^{-14}

C. 1×10^{-16}

D. 1.67×10^{-14}

Answer: A

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2. When a solution of benzoic acid was titrated with $NaOH$ the pH of the solution when half the acid neutralized was 4.2. Dissociation constant of the acid is

A. 6.31×10^{-5}

B. 3.2×10^{-5}

C. 8.7×10^{-8}

D. 6.42×10^{-4}

Answer: A

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3. 10^{-2} mole of $NaOH$ was added to $10 litres$ of water. The pH will change by

A. 4

B. 3

C. 11

D. 7

Answer: A

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4. If an acidic indicator HIn ionies as $HIn \Leftrightarrow H^{+} + In^{-}$. To which maximum pH value its solution has distinct colour characterstic of HIn

A. $pK_{\text{in}} - 1$

B. $pK_{\text{in}} \pm 1$

C. pK_{in}

D. 7

Answer: B

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5. Let the solubilities of $AgCl$ in pure water be $0.01 M CaCl_2, 0.01 M NaCl$ and $0.05 M AgNO_3$ be s_1, s_2, s_3 and s_4 respectively. What is the correct order of these quantities? Neglect any complexation.

A. $S_1 > S_2 > S_3 > S_4$

B. $S_1 > S_3 > S_2 > S_4$

C. $S_1 > S_2 = S_3 > S_4$

D. $S_1 > S_3 > S_4 < S_2$

Answer: B

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6. What would be the pH of an ammonia solution if that of an acetic acid solution of equal strength is 3.2? Assume dissociation constants for NH_3 and acetic acid are equal.

A. 3.2

B. 6.4

C. 9.6

D. 10.8

Answer: D

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7. pH of saturated solution of $Ba(OH)_2$ is 12. The value of solubility product (K_{sp}) of $Ba(OH)_2$ is

A. $10^{-6}M^3$

B. $4 \times 10^{-6}M^3$

C. $0.5 \times 10^{-7}M^3$

D. $5 \times 10^{-7}M^3$

Answer: D

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8. The hydrolysis constant for $ZnCl_2$ will be

where K_b is effective dissociation constant of base Zn^{++}

A. $K_h = \frac{K_w}{K_b}$

B. $K_h = \frac{K_w^2}{K_b}$

C. $K_h = \frac{K_w^2}{K_b^2}$

D. $K_h = \frac{K_b}{K_w^2}$

Answer: B

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9. In which case pH will not change on dilution

A. $0.01 M CH_3COONa + 0.01 M CH_3COOH$ buffer

B. $0.01 M CH_3COONH_4$

C. $0.01 M NaH_2PO_4$

D. in all cases

Answer: D

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10. $M(OH)_X$ has $K_{SP} 4 \times 10^{-12}$ and solubility $10^{-4} M$.

The value of x is:

A. 1

B. 2

C. 3

D. -4

Answer: B

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11. 1 M benzoic acid $(pK_a = 4.20)$ and 1 M C_6H_5COONa solutions are given separately What is the volume of benzoic acid required to prepare a 300 ml buffer solution of pH =4.5 ? [log 2 =0.3]

A. $200ml$

B. $150ml$

C. $100ml$

D. $50ml$

Answer: C

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12. The pH of an aqueous solution of $0.1M$ solution of a weak monoprotic acid which is 1% ionised is

A. 1

B. 2

C. 3

D. 11

Answer: C

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13. pH of a $10^{-10} M NaOH$ is nearest to

A. 10

B. 7

C. 4

D. 10

Answer: B

Watch Video Solution

14. The dissocication constant of a weak acid is 1.0×10^{-5}, the equilibrium constant for the reaction with strong base is

A. 1.0×10^{-5}

B. 1.0×10^{-9}

C. 1.0×10^{9}

D. 1.0×10^{14}

Answer: C

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15. The pH of $0.1M$ solution of the following salts increases in the order

A. $NaCl < NH_4Cl < NaCN < HCl$

B. $HCl < NH_4Cl < NaCl < NaCN$

C. $NaCN < NH_4Cl < NaCl < HCl$

D. $HCl < NaCl < NaCN < NH_4Cl$

Answer: D

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16. In the equilibrium $A^- + H_2O \Leftrightarrow HA + OH^- \left(K_a = 1.0 \times 10^{-5}\right)$. The

degree of hydrolysis of $0.001M$ solution of the salt is

A. 10^{-3}

B. 10^{-4}

C. 10^{-5}

D. 10^{-6}

Answer: A

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17. The sulphide ion concentration $[S^{2-}]$ in saturated H_2S solution is 1×10^{-22}. Which of the following sulphides should be quantitavely precipitated by H_2S in the presence of dil. HCl?

Sulphide	Solubility Product
(I)	1.4×10^{16}
(II)	1.2×10^{-22}
(III)	8.2×10^{-46}
(IV)	5.0×10^{-34}

A. I,II

B. III,IV

C. II,III,IV

D. Only I

Answer: B

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18. The K_{sp} of CuS, Ag_2S and HgS are 10^{-31}, 10^{-44} and 10^{-54} respectively. The solubility of these sulphides are in the order.

A. $Ag_2S > HgS > CuS$

B. $HgS > CuS > Ag_2S$

C. `HgSgtAg_(2)SgtCuS

D. $Ag_2S > CuS > HgS$

Answer: D

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19. For a weak acid HA with dissociation constant 10^{-9}, pOH of its $0.1M$ solution is

A. 9

B. 3

C. 11

D. 10

Answer: D

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20. The concentration of $[H^{+}]$ and concentration of $[OH^{-}]$ of a 0.1 aqueous solution of 2% ionised weak acid is [Ionic product of water $= 1 \times 10^{-14}$]

A. $2 \times 10^{-3}M$ and $5 \times 10^{-12}M$

B. $1 \times 10^{-3}M$ and $3 \times 10^{-11}M$

C. $0.02 \times 10^{-3}M$ and $5 \times 10^{-11}M$

D. $3 \times 10^{-2}M$ and $4 \times 10^{-13}M$

Answer: A

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21. If $50ml$ of $0.2MKOH$ is added to $40ml$ of $0.05MHCOOH$, the pH of the resulting solution is ($K_a = 1.8 \times 10^{-4}$)

A. 3.4

B. 7.5

C. 5.6

D. 3.75

Answer: A

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22. What is the pH of a $1MCH_3COOH$ a solution K_a of acetic acid $= 1.8 \times 10^{-5}$?

$K = 10^{-14} mol^2 litre^{-2}$

A. 9.4

B. 4.8

C. 3.6

D. 2.4

Answer: A

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23. What will be the pH of a solution formed by mixing $40ml$ of $0.10 M HCl$ with $10ml$ of $0.45 M NaOH$?

A. 12

B. 10

C. 8

D. 6

Answer: A

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24. By adding $20ml 0.1 N HCl$ to $20ml 0.001 N KOH$, the pH of the obtained solution will be

A. 2

B. 1.3

C. 0

D. 7

Answer: B

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25. The solubility product of a sparingly soluble salt AB at room temperature is 1.21×10^{-6}. Its molar solubility is

A. 1.21×10^{-6}

B. 1.21×10^{-3}

C. 1.1×10^{-4}

D. 1.1×10^{-3}

Answer: D

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26. According to Bronsted principle, an aqueous solution of HNO_3 will contain

A. NO_2^-

B. NO_3^-

C. NO_2^+

D. NO^+

Answer: B

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27. Orthoboric acid in aqueous medium is

A. Monobasic

B. Dibasic

C. Tribasic

D. All are correct

Answer: A

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28. Assertion: A solution of $FeCl_3$ in water produces brown precipitate on standing.

Reason: Hydrolysis of $FeCl_3$ takes place in water.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both the assertion and reason are true and reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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29. Assertion (A): $BaCO_3$ is more soluble in HNO_3 than in water.

Reason (R): Carbonate is a weak base and reacts with $H^{\oplus}$ ions to form strong acid causing barium salt to dissociate.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both the assertion and reason are true and reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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30. Assertion: $CHCl_3$ is more acidic than CHF_3.

Reason: The conjugate base of $CHCl_3$ is more stable than CHF_3.

A. If both assertion and reason are true and the reason is the correct explantion of the assertion.

B. If both the assertion and reason are true and reason is not the correct explanation of assertion.

C. If the assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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Others

1. Dissociation constants of two acids HA and HB are respectively 4×10^{-10} and 1.8×10^{-5}, whose pH value will be higher for a given molarity:

A. HA

B. HB

C. Both same

D. Can't say

Answer: A

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2. A monoprotic acid in $1.00M$ solution is 0.01% ionised. The dissociation constant of this acid is

A. 1×10^{-8}

B. 1×10^{-4}

C. 1×10^{-6}

D. 10^{-5}

Answer: A

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3. The dissociation constants of two acids HA_1 and HA_2 are 3.0×10^{-4} and 1.8×10^{-5} respectively. The relative strengths of the acids will be approximately

A. $1:4$

B. $4:1$

C. $1:16$

D. $16:1$

Answer: B

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4. Which of the following can act both as Bronsted acid and as Bronsted base ?

A. Cl^{-}

B. HCO_3^{-}

C. H_3O^{+}

D. OH^{-}

Answer: B

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5. pH of water is 7.0 at $25^{\circ} C$. If water is heated to $70^{\circ} C$, the:

A. pH will decrease and solution becomes acidic

B. pH will increase

C. pH will remain constant as 7

D. pH will decrease but solution will be neutral

Answer: D

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6. The equivalent conductance at infinite dilution of a weak acid such as HF

A. Can be determined by measurement of very dilute HF solution

B. Can be determined by extrapoltaion of measurements on dilute solutions of HCl, HBr and HI

C. Can best be determined from measurements on dilute solutions of NaF, $NaCl$ and HCl

D. Is an underfined quantity

Answer: C

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7. $100ml$ of $0.2MH_2SO_4$ is added to $100ml$ of $0.2MNaOH$. The resulting solution will be

A. Acidic

B. Basic

C. Neutral

D. Slightly basic

Answer: A

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8. K_a for formic acid and acetic acid are 2.1×10^{-4} and 1.1×10^{-5} respectively. The relative strength of acids is:

A. $19:1$

B. $2.3:1$

C. $1:2.1$

D. $4.37:1$

Answer: D

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9. In the following reaction $HC_2O_4^-(aq) + PO_4^{3-}(aq) \Leftrightarrow HPO_4^{-2}(aq) + C_2O_4^{2-}(aq)$, which are the two Bronsted bases?

A. $HC_2O_4^-$ and PO_4^{3-}

B. HPO_4^{2-} and $C_2O_4^{2-}$

C. $HC_2O_4^-$ and HPO_4^{2-}

D. PO_4^{3-} and $C_2O_4^{2-}$

Answer: D

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10. The following equilibrium is established when $HC1O_4$ is dissolved in weak acid HF,

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

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

A. HF and $HClO_4$

B. HF and ClO_4^-

C. HF and H_2F^+

D. $HClO_4$ and H_2F^+

Answer: C

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11. $10ml$ of $1MH_2SO_4$ will completely neutralise

A. $10ml$ of $1MNaOH$ solution

B. $10ml$ of $2MNaOH$ solution

C. $5ml$ of $2MKOH$ solution

D. $5ml$ of $1MNa_2CO_3$ solution

Answer: B

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12. Boric acid H_3BO_3 is a:

A. Arrhenius acid

B. Bronsted acid

C. Lewis acid

D. All of these

Answer: C

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13. The hydrogen ion concentration in weak acid of dissociation constant K_a and concentration c is nearly equal to

A. $\sqrt{K_a / c}$

B. c / K_a

C. $K_a c$

D. $\sqrt{K_a c}$

Answer: D

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14. For $10^{-2}(M) H_3PO_3$ solution which of the following relations is correct?

A. $$[H_3PO_3] + [H_2PO_3^-] + [HPO_3^{2-}] + [PO_3^{2-}] = 10^{-2}$$

B. $[H_3PO_3] + [H_2PO_3^-] + [HPO_3^{2-}] = 10^{-2}$

C. $[H_2PO_3^-] + [HPO_3^{2-}] + [PO_3^{3-}] = 10^{-2}$

D. $[H_3PO_3] + [H_2PO_3^-] + 2[HPO_3^{2-}] = 10^{-2}$

Answer: B

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15. When $100ml$ of $1 M NaOH$ solution is mixed with $10ml$ of $10 M H_2SO_4$, the resulting mixture will be

A. Acidic

B. Alkaline

C. Neutral

D. Strongly alkaline

Answer: A

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16. What is the concentration of $Ag^+ ion$ in a $1L$ solution containing $0.02mol$ of $AgNO_3$ and $0.14mol$ of NH_3 ? For

$\left[Ag(NH_3)_2\right]^+, K_{Instab} = 10^8$

A. $2 \times 10^{-7}(M)$

B. $10^{-8}(M)$

C. $2 \times 10^{-8}(M)$

D. $2 \times 10^{-9}(M)$

Answer: C

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17. In a solution total concentration of M^{3+} is $2 \times 10^{-3}(M)$ and total concentration of SCN^- is $1.51 \times 10^{-3}(M)$ and free SCN^- concentration $= 1 \times 10^{-5}(M)$

What is the dissociation constant of the complex $M(SCN)^{2+}$?

A. 2×10^5

B. 2×10^{-5}

C. 3.33×10^5

D. 3.33×10^{-6}

Answer: D

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18. The salt that forms neutral solution in water is

A. NH_4Cl

B. $NaCl$

C. Na_2CO_3

D. K_3BO_3

Answer: B

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19. The dissociation constant of a monobasic acid which is 3.5% dissociated in $\frac{N}{20}$ solution at $20^\circ C$ is

A. 3.5×10^{-2}

B. 5×10^{-3}

C. 6.34×10^{-5}

D. 6.75×10^{-2}

Answer: C

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20. Which of the following substance is an electrolyte?

A. Chloroform

B. Benzene

C. Toluene

D. Magnesium chloride

Answer: D

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21. The species among the following which can act as an acid and as a base is

A. HSO_4^-

B. SO_4^{2-}

C. H_3O^+

D. Cl^-

Answer: A

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22. The dissociation constant of weak acid HA is 4.9×10^{-8}. After making the necessary approximations, calculate pH in $0.1M$ acid.

A. 1.155

B. 2.155

C. 3.155

D. 4.155

Answer: D

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23. The K_a for formic acid and acetic acid are 2×10^{-4} and 2×10^{-5} respectively. Calculate the relative strength of acids with same molar concentration

A. $\sqrt{10}$

B. $\sqrt{7}$

C. $\sqrt{8}$

D. $\sqrt{5}$

Answer: A

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24. Which among the following is strongest acid ?

A. $H(ClO)O_2$

B. $H(ClO)O_3$

C. $H(ClO)O$

D. $H(ClO)$

Answer: B

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25. Calculate pH of $0.002 N NH_4OH$ having 2% dissociation

A. 7.6

B. 8.6

C. 9.6

D. 10.6

Answer: C

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26. What concentration of acetic acid is needed to give a hudrogen ion concentration of $3.5 \times 10^{-4} M$?

$\left(K_a = 1.8 \times 10^{-5}\right)$?

A. $3.5 \times 10^{-4} M$

B. $6.80 \times 10^{-3} M$

C. $4.2 \times 10^{-4} M$

D. $7.2 \times 10^{-4} M$

Answer: B

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27. A solution of acetic acid is 1.0% ionised. Determine the molar concentration of acid $\left(K_a = 1.8 \times 10^{-5}\right)$ and also the $\left[H^{+}\right]$.

A. $1.8 \times 10^{-1} M$ and $1.8 \times 10^{-3} M$

B. $0.18 \times 10^{-1} M$ and $1.8 \times 10^{-4} M$

C. $0.18 \times 10^{-2} M$ and $1.8 \times 10^{-2} M$

D. $0.18 \times 10^{-3} M$ and $1.8 \times 10^{-1} M$

Answer: A

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28. BOH is a weak base, molar concentration of BOH that provides a $[OH]^{-}$ of $1.5 \times 10^{-3} M \left[K_b(BOH) = 1.5 \times 10^{-5} M\right]$ is

A. $0.15M$

B. $0.1515M$

C. $0.0015M$

D. $1.5 \times 10^{-5} M$

Answer: A

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29. Lemon juice normally has a pH of 2. If all the acid the lemon juice is citric acid and there are no citrate salts present, then what will be the citric acid concentration $[Hcit]$ in the lemon juice? (Assume that only the first hydrogen of citric acid is important)

$HCit \Leftrightarrow H^{+} + Cit^{-}, K_a = 8.4 \times 10^{-4} molL^{-1}$

A. $8.4 \times 10^{-4} M$

B. $4.2 \times 10^{-4} M$

C. $16.8 \times 10^{-4} M$

D. $11.9 \times 10^{-2} M$

Answer: D

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30. Strongest conjugate base is

A. $C1^-$

B. Br^-

C. F^-

D. I^-

Answer: C

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31. $0.2M$ solution of a weak acid HA is 1% ionised $25^\circ C$.

K_a for the acid is equal to

A. $\dfrac{0.002 \times 0.002}{0.198}$

B. $\dfrac{0.02 \times 0.02}{0.18}$

C. $\dfrac{0.01 \times 0.01}{0.19}$

D. $\dfrac{0.19}{0.01 \times 0.01}$

Answer: A

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32. An aqueous solution of aluminium sulphate would show

A. An acidic reaction

B. An neutral reaction

C. An basic reaction

D. Both acidic and basic reaction

Answer: A

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33. Which of the following has highest proton affinity?

A. NH_3

B. PH_3

C. H_2O

D. H_2S

Answer: A

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

A. HPO_4^{2-}

B. P_2O_5

C. H_3PO_4

D. PO_4^{3-}

Answer: A

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35. According to Bronsted principle, an aqueous solution of HNO_3 will contain

A. NO_2^-

B. NO_3^-

C. NO_2^+

D. NO^+

Answer: B

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36. The conjugate base of OH^- is :

A. O_2

B. H_2O

C. O^-

D. O^{2-}

Answer: D

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37. Would gaseous HCl be considered as an Arrhenius acid?

A. Yes

B. No

C. Not known

D. Gaseous HCl does not exist

Answer: B

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38. The first and second dissociation constant of an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} respectively. The overall dissociation constant of the acid will be

A. 5.0×10^{-5}

B. 5.0×10^{15}

C. 5.0×10^{-15}

D. 0.2×10^{5}

Answer: C

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39. An aqueous solution of sodium carbonate is alkaline because sodium carbonate is a salt of

A. Weak acid and weak base

B. Strong acid and weak base

C. Weak acid and strong base

D. Strong acid and strong base

Answer: C

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40. Four species are listed below:

$(i)\ HCO_3^-$

$(ii)\ H_3O^+$

$(iii)\ HSO_4^-$

$(iv)\ HSO_3F$

Which one of the following is the correct sequence of their acid strength?

A. $iv < ii < iii < i$

B. $ii < iii < i < iv$

C. $i < iii < ii < iv$

D. $iii < i < iv < ii$

Answer: C

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41. Ammonia gas dissolves in water to form NH_4OH. In this reaction water acts as

A. A conjugate base

B. A non-polar solvent

C. An acid

D. A base

Answer: C

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42. The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionisation constant, K_a of the acid is

A. 3×10^{-1}

B. 1×10^{-3}

C. 1×10^{-5}

D. 1×10^{-7}

Answer: C

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43. Orthoboric acid in aqueous medium is

A. Monobasic

B. Dibasic

C. Tribasic

D. All are correct

Answer: A

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44. Three reactions involving $H_2PO_4^-$ are given below

$I.\ H_3PO_4 + H_2O \rightarrow H_3O^+ + H_2PO_4^-$

$II.\ H_2PO_4^- + H_2O \rightarrow HPO_4^{2-} + H_3O^+$

$III.\ H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{2+}$

In which of the above does $H_2PO_4^-$ act as an acid?

A. II only

B. I and II

C. III only

D. I only

Answer: A

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