CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

IONIC EQUILIBRIA

Wb Jee Workout

1. Which of the following would be an acidic solution?

A. Solution having hydrogen ion concentration of 10^{-7}M

B. Solution having hydrogen ion concentration of 10^{-13} M

C. Solution having hydrogen ion concentration of 10^{-2}M

D. Solution having hydrogen ion concentration of 10^{-12} M

Answer: C

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2. A solution of NaCl in contact with atmosphere has a pH of about

A. 3.5

B. 5

C. 7

D. 14

Answer: C

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3. Given that K, for acetic acid as 1.8×10^{-5} and K_b of NH_4OH as 1.8×10^{-5} at 25°C, predict the nature of aqueous solution of ammonium acetate.

A. Acidic

B. Basic

C. lightly acidic or basic

D. Neutral

Answer: D

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4. Amongst the following hydroxides, the one which has the lowest value of K_{sp} at ordinary temperature (about 25° C) is

A. $Mg(OH)_2$

B. $Ca(OH)_2$

C. $Ba(OH)_2$

D. $Be(OH)_7$

Answer: D

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5. The solubility of $Mg_3(PO_4)_2$ is S mol L^{-1} The solubility product is given by the relation

A. s^5

B. $36s^5$

C. $6s^5$

D. $108s^5$

Answer: D

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6. When equal voluines of the following solutions are mixed, precipitation of AgCl (K $= 1.8 \times 10^{-10}$) will occur only with

A. $10^{-4}MAg^+$ and $10^{-4}MCI^-$

B. $10^{-5}MAg^+$ and $10^{-5}MCI^-$

C. $10^{-6}MAg^{+}And10^{-6}MCI^{-}$

D. $10^{-10}MAg^{+}$ and $10^{-10}MCI^{-}$

Answer: A

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7. Ostwald dilution law is applicable to the dissociation of

A. ammonium hydroxide

B. sulphuric acid

C. hydrochloric acid

D. sodium chloride

Answer: A

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8. Which is the correct representation for the solubility product constant of Ag_2CrO_4?

A. $\left[Ag^+\right]^2\left[CrO_4^{2-}\right]$

B. $\left[2Ag^+\right]\left[CrO_4^{2-}\right]$

C. $\left[Ag^+\right]\left[CrO_4^{2-}\right]$

D. $\left[2Ag^+\right]\left[CrO_4^{2-}\right]$

Answer: A

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9. "Ostwald dilution law" constituents one of the postulates of the "Arrhenius theory of electrolytic dissociation". It is valid for

A. strong electrolytes

B. weak electrolytes

C. both strong and weak electrolytes

D. non-electrolytes.

Answer: B

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10. In the reaction, $AgCl + KI \Leftrightarrow KCI + Agl$ when KI is added, the equilibrium is shifted towards right giving more AgI precipitate, because

A. both AgCl and AgI are sparingly soluble

B. the K_{sp} of AgI is lower than K_{sp} of AgCl

C. the K_{sp} of AgI is higher than K_{sp} of AgCI

D. both AgCl and AgI have same solubility product.

Answer: B

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11. pk_a values of two acids A and B are 4 and 5. The strength of these two acids are related as

A. acid A is 10 times stronger than acid B

B. strength of acid A: strength of acid B = 4:5

C. the strength of two acids cannot be compared

D. acid B is 10 times stronger than acid A

Answer: A

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12. Which one of the following is the buffer solution of strong acidic nature?

A. $HCOOH + HCOO^-$

B. $CH_3COOH + CH_3COO^-$

C. $HC_2O_4^- + C_2O_4^{2-}$

D. $H_3BO_3 + BO_3^{3-}$

Answer: A

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13. An example of salt that will not hydrolyse is

A. NH_4CI

B. KCI

C. CH_3COONH_4

D. CH_3COOK

Answer: B

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14. The pH of pure water at $50^\circ C$ is $(K_w - 13.26 at 50^\circ C)$

A. 7.0

B. 7.13

C. 6.0

D. 6.63

Answer: D

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

A. $(NH_4)_2CO_3$

B. CH_3COONa

C. CH_3COONH_4

D. $BaCI_2$

Answer: B

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16. To an aqueous solution of Ag_2CrO_4 above its own precipitate, CrO_4^{2-} ions are added in the form of solution. This results in

A. increase in concentration of Ag^+ ions

B. decrease in concentration of Ag^+ ions

C. increase in the value of solubility product

D. decrease in the value of solubility product.

Answer: B

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17. The pH of blood does not appreciably change by a small addition of acid or a base because blood

A. serum protein present in blood acts as buffer

B. contains iron as a part of the molecule

C. can be easily coagulated

D. has a very high pH.

Answer: A

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18. The pH of a solution is increased from 3 to 6 , its H^+ ion concentration will be

A. reduced to half

B. doubled

C. reduced by 1000 times

D. increased by 1000 times.

Answer: C

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19. pH of 0.01 M $(NH_4)_2SO_4$ and $0.02MNH_4OH$ buffer (PK_a of $NH_4^+ = 9.26$) is

A. $4.74 + \log 2$

B. $4.74 - \log 2$

C. $4.74 + \log 1$

D. $9.26 + \log 1$

Answer: D

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20. 1 M solution of an acid has a pH of 5. Which of the following is the most reasonable explanation for this acid?

A. The acid is too dilute.

B. It is a strong acid.

C. It reacts with water to produce a high concentration of hydronium ions

D. It is a weak acid.

Answer: D

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21. Why only Cd^{2+} gets precipitated as CdS and not Ni^{2+} as Nis when H_2S is passed through an acidic solution containing Cd^{2+} and Ni^{2+}?

A. Solubility product of CdS is less than that of Nis.

B. Enough Cd^{2+} are present in acidic medium

C. Nickel salt does not ionize in acidic medium.

D. Solubility product changes in presence of an acid.

Answer: A

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22. For anionic hydrolysis, pH is given by

A. $pH = \frac{1}{2}pK_w - \frac{1}{2}pK_b - \frac{1}{2}\log C$

B. $pH = \frac{1}{2}pK_w + \frac{1}{2}pK_a - \frac{1}{2}\log C$

C. $pH = \frac{1}{2}pK_w + \frac{1}{2}pK_a + \frac{1}{2}\log C$

D. $pH = \frac{1}{2}pK_w + \frac{1}{2}pK_a - \frac{1}{2}pK_b$

Answer: C

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23. 0.001 mole of strong electrolyte $Zn(OH)_2$ is present in 200 mL of an aqueous solution. The pH of this solution is

A. 2

B. 4

C. 12

D. 10

Answer: C

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24. A certain buffer solution contains equal concentration of X^- and HX. The K_a for HX is 10^{-8} The pH of the buffer is

A. 5

B. 8

C. 6

D. 14

Answer: B

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25. The solubility products of $Al(OH)_3$ and $Zn(OH)_2$ are 8.5×10^{-23} and 1.8×10^{-14} respectively. If NH_4OH is added to a solution containing Al^{3+} and Zn^{2+} ions, then substance precipitated first is

A. $Al(OH)_2$

B. $Zn(OH)_2$

C. both simultaneously

D. none of these

Answer: A

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26. The following equilibrium is established when hydrogen chloride is dissolved in acetic acid. $HCl + CH2COOH \Leftrightarrow CI^- + CH_3COOH_2^+$ The set that characterises the conjugate acid-base pair is

A. (HCI, CH_3COOH) and $(CH_3COOH_2^+, CI^-)$

B. $(HCI, CH_3COOH_2^+)$ and (CH_3COOH, CI^-)

C. $\{CH_3COOH_2^+, HCI)$ and (CI^-, cH_3COOH)

D. (HCI, CI^-) and $(CH_3COOH_2^+, CH_3COOH_2^+, CH_3COOH)$

Answer: B

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27. Phenolphthalein does not act as an indicator for the titration between

A. $NaOH$ and CH_3COOH

B. $H_2C_2O_4$ and $KmnO_4$ sol

C. NII_4 and $IICI$

D. KOH and H_2SO_4

Answer: C

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28. Hydrogen ion concentration of a solution whose pH is zero, would be

A. $2.0gionL^{-1}$

B. $1.0gionL^{-1}$

C. $10^{-7}gionL^{-1}$

D. $10^{-14}GionL^{-1}$

Answer: B

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29. Which of the following would not change the pH of 10 cm of dilute HCl when added to the acid ?

A. $5cm^3$ of pure water

B. $20cm^3$ or pure water

C. $10, cm^3$ of conc HCI

D. $20cm^3$ of same dil HCI

Answer: D

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

A. Br^-, CI^-, I^-

B. I^-, CI^-, Br^-

C. I^-, Br^-, CI^-

D. Br^-, I^-, CI^-

Answer: C

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31. How many grams of sodium acetate are to be added to a litre of 0.4 M CH_3COOH solution so that the $\left[H^+\right]$ of the resultant solution is 2×10^{-4} g ion/L? (Given K_a for acetic acid $= 1.8 \times 10^{-5}$)

A. $3.502g$

B. $2.952g$

C. $4.252g$

D. $5.162g$

Answer: B

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32. 100 mL of HCl gas at $25^\circ C$ and 740 mm pressure was dissolved in 1 L of water. What will be the pH of solution. (Given, vapour pressure of H_2O at $25^\circ C$is 23.7 mm.)

A. 2.012

B. 3.241

C. 2.414

D. 3.021

Answer: C

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33. The pH of blood stream is maintained by a proper balance of H_2CO_3 and $NaHCO_3$ concentrations. What volume of 5 M $NaHCO_3$ solution should be mixed with a 10 mL sample of blood which is 2 Min H_2CO_3, in order to maintain a pH of 7.4? K_a for H_2CO_3 in blood is 7.8×10^{-7}

A. $50.20mL$

B. $62.42mL$

C. $78.37mL$

D. $52.41mL$

Answer: C

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34. When 1 L of a saturated solution of $PbCI_2$, is evaporated to dryness, the residue is found to weigh 4.5 g. What will be the K_{sp} for $PbCl_2$?

A. 1.70×10^{-5}

B. 2.70×10^{-6}

C. 3.20×10^{-5}

D. 1.80×10^{-6}

Answer: A

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35. 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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36. It is found that 0.01 M solution of four sodium salts Na, Nal, NaC and NaD have the following pH values: (i) NaD - 10.0 (ii) NaC = 9.0 (iii) NaB - 8.0 (iv) Na4 - 7.0 Which of the corresponding acids is strongest?

A. NaA

B. NaB

C. NaC

D. NaD

Answer: A

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

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

B. $1 \times 10^{-3} M$ and $5 \times 10^{-12} M$

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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38. The solubility product of silver chromate be K_{sp}, its solubility is

A. $\sqrt[3]{K_{sp}/8}$

B. $\sqrt[3]{K_{sp}}$

C. $\sqrt[3]{K_{sp}/4}$

D. $\sqrt[3]{K_{sp}/2}$

Answer: C

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39. What is the maximum pH of a 0.1 M Mg^{2+} solution from which $Mg(OH)_2$ will not be precipitated $[K = 1.2 \times 10^{-11}]$?

A. 11.02

B. 8.40

C. 6.42

D. 9.04

Answer: D

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40. The pH of a 0.1 N solution of NH_4Cl is 5.4. What will the hydrolysis constant? (supposing degree of hydrolysis as very small)

A. 2.42×10^{-10}

B. 1.42×10^{-10}

C. 1.58×10^{-9}

D. 2.82×10^{-9}

Answer: C

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41. A sample of mixed alkali contains $NaOH$ and Na_2CO_3 is titrated in the following two schemes. (1) 10 mL of above mixture requires 8 mL of 0.1 N HCl by using phenolphthalein. (ii) 10 mL of above mixture requires 10

mL 0.1 N HCI by using methyl orange. What will be the ratio of the weight of NaOH and Na2CO3 in the sample mixture?

A. $1:132$

B. 2.412

C. 2.122

D. $3.142:1$

Answer: A

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42. What will be the basicity of an acid, if 2 moles of it requires 400 mL of 5N KOH for complete neutralisation?

A. 1

B. 2

C. 3

D. 4

Answer: A

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43. Solubility product of Mg(OH)at ordinary temperature is 1.96×10^{-11}. pH of a saturated soln. of $Mg(OH)_2$ will be

A. 10.53

B. 8.47

C. 6.94

D. 3.47

Answer: A

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44. A weak acid of dissociation constant 10^{-5} is being titrated with aqueous NaOH solution. The pH at the point of one-third neutralisation of the acid will be

A. $5 + lgo2 - \log 3$

B. $5 - \log 2$

C. $5 - \log 3$

D. $5 - \log 6$

Answer: B

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45. A 100 mL 0.1 M solution of ammonium acetate is diluted by adding 100 mL of water. The pH of the resulting solution will be (PK_a of acetic acid is nearly equal to pK_a of NH_4OH)

A. 4.9

B. 5.0

C. 7.0

D. 10.0

Answer: C

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46. The concentration of sulphide ion in 0.1 M HCI solution saturated with hydrogen sulphide is 1.0×10^{-19} M. If 10 mL of this solution is added to 5 ml of 0.04 M solution of $FeSO_4$, $MnCl_2$, $ZnCl_2$ and $CdCl_2$, in which solutions precipitation will take place? (Given K_{sp} for $FeS = 6,3 \times 10^{-18}$, $MnS = 2.5 \times 10^{-13}$, $ZnS = 1.6 \times 10^{-24}$ and CdS =

.)

A. $FeSO_4$

B. $MnCI_2$

C. $ZnCI_2$

D. $CdCI_2$

Answer: C::D

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47. pH of which solution is not affected by dilution

A. $0.01MCH_3COONH_4$

B. $0.01MNaH_2PO_4$

C. $0.01MNaCl$

D. $0.01MNaHCO_3$

Answer: A::B::D

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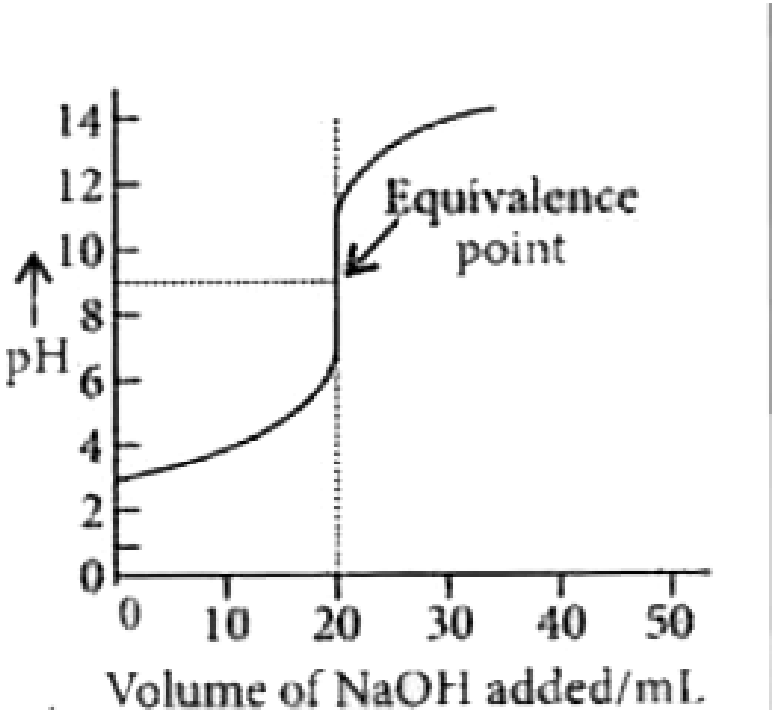
48. Following is the titration curve of CH_3COOH against NaOH added with phenolphthalein as the indicator. K_{in} value of phenolphthalein is 4.0×10^{10} Choose the incorrect statement.



A. It begins to change colour from the pH 9.4.

B. It begins to change colour from acid (colourless) at pH 8.4 to the base form (reddish pink) at pH 10.4.

C. Phenolphthalein is suitable indicator for $CH_3COOH - NaOH$ titration.

D. Phenolphthalein is a weak acid.

Answer: A

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49. Which of the following aqueous solutions will have a pH less than 7.0?

A. NH_4NO_3

B. $NaOH$

C. $FeCI_3$

D. Na_3PO_4

Answer: A::C

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50. Buffer solution can be obtained by mixing aqueous solution of

A. CH_3COONa and excess HCI

B. CH_3COONa and CH_3COOH

C. $NaOH$ and $NaCI$

D. CH_3COOH and exces $NaOH$

Answer: B

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51. Which of the following will decrease the pH of a 50 mL solution of 0.01 M HCI?

A. Addition of 5 mL of 1 M HCI

B. Addition of 50 mL of 0.01 M HCI

C. Addition of 50 mL of 0.002 M HCI

D. Addition of Mg

Answer: A

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52. Which of the following statement(s) is (are) correct?

A. The pH of 1.0×10^{-8} M solution of HCl is 8.

B. The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

C. Autoprotolysis constant of water increases with temperature.

D. When a solution of a weak monoprotic acid is titrated against a strong base, at half-neutralisation point pH = (1/2) pk_a

Answer: B::C

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53. Which of the following expressions is applicable to the hydrolysis equilibrium?

$CN^- + H_2O \Leftrightarrow HCN + OH^-$

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

B. $h = \left(\frac{\sqrt{k_h}}{C}\right)$

C. $pH = \frac{1}{2} pK_a[HCN]$

D. $\left[H^+\right] = \sqrt{\frac{k_w \times K_a}{C}}$

Answer: A::B::D

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54. In 0.020 M carbonic acid solution

A. H_2CO_3 is stronger acid than HCO_3^-

B. $H_2CO_3 \Leftrightarrow 2H^+ + CO_3^{3-}, k_{eq} = K_{a_1}.K_{a_2}$

C. $\left[HCO_3^-\right] \approx \left[CO_3^{2-}\right]$

D. It can be said $k_{a_i} > > K_w$

Answer: A::B::D

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55. The acid dissociation constant for $Al(H_2O)_6^{3+}$ is 1.4×10^{-5} . It suggests

A. H_2O molecules in the hydrated cation are much stronger proton donors than free solvent water molecules

B. Ionisation , $Al(H_2O)_6^{3+}\_((aq)) \Leftrightarrow AL^{3+}\_(aq) + H_2O$

C. Ionisation ,

$$Al(H_2O)_{6\,(aq)}^{3+} + H_2O_{(l)} \Leftrightarrow H_3O^+{}_{(aq)} + \left[Al(H_2O)_5(OH)\right]_{(aq)}^{2+}$$

D. Its pH might be more than 7.

Answer: A::C

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Wb Jee Previous Years Questions

1. At 25°C, the solubility product of a salt of MX_2 type is 3.2×10^{-8} in water. The solubility (in mol/L) of MX_2 in water at the same temperature will be

A. 1.2×10^{-3}

B. 2×10^{-3}

C. 3.2×10^{-3}

D. 1.75×10^{-3}

Answer: B

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2. The different colours of litmus in acidic, neutral and basic solutions are respectively

A. red, orange and blue

B. blue, violet and red

C. red, colourless and blue

D. red, violet and blue

Answer: D

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3. At 25° C, pH of a 10^{-8} M aqueous KOH solution will be

A. 6.0

B. 7.02

C. 8.02

D. 9.02

Answer: B

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4. The pH of 10^{-4} M KOH solution will be

A. 4

B. 11

C. 10.5

D. 10

Answer: D

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5. The ratio of volumes of CH_3COOH0.1 (N) to CH_3COONa0.1(N) required to prepare a buffer solution of pH 5.74 is (given : pK_a of $CH_3COOH$is 4.74)

A. $10:1$

B. $5:1$

C. $1:5$

D. $1:10$

Answer: D

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6. The molar solubility (in $molL^{-1}$) of a sparingly soluble salt MX_4 is 'S'. The corresponding solubility product is 'K_{sp}' 'S' in terms of K_{sp}' is given by the reaction

A. $S = \frac{(K_{sp})}{128}\Big)^{1/4}$

B. $S = \left(\frac{K_{sp}}{256}\right)^{1/5}$

C. $S = (256K_{sp})^{1/5}$

D. $S - (128K_{sp})^{1/4}$

Answer: B

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7. Dissolving NaCN in de-ionized water will result in a solution having

A. $PH < 7$

B. $pH = 7$

C. $pOH = 7$

D. $pH > 7$

Answer: D

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8. Which of the following mixtures will have the lowest pH at 298 K?

A. $10mL0.05NCH_3COOH + 5mL0.1N_4NHOH$

B. $5mL0.2NNH_4CI + 5mL0.2NNH_4OH$

C. $5mL0.1NCH_3COOH + 10mL0.05NCH_3COONa$

D. $5mL0.1NCH_3COOH + 5mL0.1NNaOH$

Answer: C

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9. 1×10^{-3} mole of HCI is added to a buffer solution made up of 0.01 M acetic acid and 0.01 M sodium acetate. The final pH of the buffer will be given, PK of acetic acid is 4.75 at $25^{\circ} C$)

A. 4.60

B. 4.66

C. 4.75

D. 4.8

Answer: B

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10. In which of the following mixed aqueous solutions pH = pk_a at equilibrium?

(1) $100mLof0.1MCH_3COOH + 100mL\text{of}0.1MCH_3COONa$

$(2)100mLof0.1MCH_3COOH + 50mLof0.1MNaOH$

(3) $100mLof0.1MCH_3COOH + 100mLof0.1MNaOH$

$(4)100mLof0.1MCH_3COOH + 100mLof0,1MNH_3$

A. (1) is correct.

B. (2) is correct.

C. (3) is correct.

D. Both (1) and (2) are correct.

Answer: A::B::D

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