CHEMISTRY

BOOKS - CHETANA PUBLICATION

Ionic Equilibria

Example

1. What is chemical equilibrium?

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2. What are electrolytes?

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3. What is ionic equilibrium?

4. Define electrolytes.

5. What are non-electroytes?

6. What are strong and weak electrolytes? Give two examples each.

7. Which of the following is a strong electrolyte?

$HF, AgCI, CuSO_4, CH_3COONH_4, H_3PO_4$

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8. Classity the following as strong and weak electrolytes.

$BaSO4, HCOOH, HCN, MnSO4, FeSO4, H_2CO_3, HCl, NaOH, HNO3$

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9. What is ionization and dissociation?

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10. Define degree of dissociation or ionization.

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11. Name the adds present in (a) Vinegar (b) Lemons (c) tamarind paste and name the base present in household deaning products.

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12. What are acid and base according to Arrhenius theory?

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13. What are bare ions and hydronium ions?

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14. Define acid base according to Bronsted-Lowry theory.

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15. Explain with an example Bronsted-Lowry concept of acid and base. OR

What is meant by conjugate add-base pair?

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16. Write examples of conjugate add-base pairs.

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17. Define acid and base according to Lewis theory with examples.

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18. Why cations are Lewis acids?

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19. Write examples of Lewis acids and Lewis bases (any one of each).

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20. Ammonia serves as a Lewis base whereas $AlCI_3$ is a Lewis acid. Explain.

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21. All Bronsted bases are also Lewis bases but all Bronsted acid are not Lewis acid. Explain.

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22. Explain amphoteric nature of water.

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23. Write a reaction in which water act as a base.

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24. How are acids and bases classified?

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25. Define Strong Acid and Bases.

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26. Define Weak acids and Weak bases.

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27. Define and explain dissociation constant of a weak acid.

28. Define and explain dissociation constant of a weak base.

29. Derive the relationship between degree of dissociation and dissociation constant in weak electrolytes. (any one)

30. Define degree of dissodation. Derive Ostwald's dilution law for CH_3COOH.

31. Explain autoionization of water.

32. Define ionic product of water.

33. Define ionic product of water.

34. Find out the values of ionic product Kw of water at various temperatures. 273K, 283K, 293K, 303K, 313K, 323K

35. What is pH scale?

36. Define pH and pOH. Derive relationship between pH and pOH.

37. Derive the relation pH + pOH = 14.

38. Using a pH scale, explain acidity, basicity and neutrality of an aqueous solution.

39. How pH of pure water vary with temperature? Explain.

40. Define hydrolysis. What are the types of salts? Write one example each.

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41. Why salt of strong acid and strong base does not undergo hydrolysis or is neutral to litmus?

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42. Why is KCl solution neutral to litmus?

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43. Explain the hydrolysis of salt of strong acid and weak base.

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44. Discuss hydrolysis of salt of weak acid and strong base.

45. Write a note on hydrolysis of salt of weak acid and weak base.

46. Why an aqueous solution of NH_4Cl is acidic while that of HCOOK is basic?

47. Why is it necessary to add H_2SO_4 while preparing the solution of $CuSO_4$?

48. Aqueous solution of sodium carbonate is alkaline whereas aqueous solution of ammonium chloride is acidic.

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49. What is meant by hydrolysis? A solution of CH_3COONH_4 is neutral. Why?

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50. A solution of NH_4F is slightly acidic. Why?

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51. The solution of NH_4CN is basic in nature. Explain.

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52. Explain the acidic nature of an aqueous solution of ferric nitrate.

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53. Define Buffer Solution.

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54. Home made jams and gellies without any added chemical preservative additives spoil in a few days whereas commercial jams and jellies have a long shelf life. Explain. What role does added sodium benzoate play?

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55. What are the various types of Buffer solution? Give one example of each.

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56. How are basic buffer solutions prepared?

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57. How are buffer solutions prepared?

▶ **Watch Video Solution**

58. Write the Henderson Hasselbalch equation for pH of buffers.

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59. Define Buffer Solution.

▶ **Watch Video Solution**

60. Write a note on buffer action of an acidic buffer.

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61. Write a note on buffer action of basic buffer.

▶ Watch Video Solution

62. Write properties of buffer solution

▶ Watch Video Solution

63. Write properties of buffer solution

▶ Watch Video Solution

64. What happens to the pH if a few drops of an acid are added to $CH_3COOH + CH_3COONa$ solution?

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65. A buffer solution of acetic acid and sodium acetate is diluted 10 times. What is the effect on its pH?

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66. What is the importance of buffers in biochemical system?

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67. What are the applications of buffer solutions?

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68. What is solubility of a compound?

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69. Explain saturated solution.

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70. What is meant by sparingly soluble salt?

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71. Define solubility product. Derive an expression for solubility product of AgCl.

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72. Write the solubility equilibrium and solubility product expression for a general salt BA.

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73. A sparingly soluble salt having general formula B_xA_y and molar solubility 'S' is in equilibrium with its saturated solution. Derive the relationship between solubility and solubility product for the salt.

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74. Define molar solubility.

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75. What is the relationship between molar solubility and solubility product for the salt Ag_2CrO_4?

76. What is the relationship between molar solubility and solubility product for salts given below: $Ca_3(PO_4)_2$.

77. What is the relationship between molar solubility and solubility product for salts given below: $Cr(OH)_3$.

78. Explain the relation between ionic product and solubility product to predict whether a precipitate will form when two solutions are mixed?

79. Define/State common ion effect.

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80. Explain common ion effect. OR Explain common ion effect for a solution containing CH_3COOH and CH_3COONa.

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81. How is the ionization of NH4OH suppressed by addition of NH_4CI to the solution of NH_4OH?

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82. How is hardness of water removed?

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83. The dissociation of H2S is suppressed in the presence of HCl. Name the phenomenon.

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84. The dissociation of HCN is suppressed by the addition of HCl. Explain.

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85. Solubility of a sparingly salt gets affected in presence of a soluble salt having one common ion. Explain.

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86. A weak monobasic acid is 0.05% dIssociated in 0.02 M solution. Calculate dissociation constant of acid.

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87. Dissociation constant of acetic acid is 1.8×10^{-5}. Calculate percent dissociation of acetic acid in 0.01 M solution.

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88. A weak monobasic acid is 12% dissociated in 0.05 M solution. What is percent dissociation in 0.15 M solution.

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89. Dissociation constant of acetic acid is 1.8×10^{-5}. Calculate percent dissociation of acetic acid in 0.01 M solution.

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90. Acetic acid is 5% ionised in its decimolar solution. Calculate the dissociation constant of acid.

91. A weak acid is 1% ionized in its 0.075 M solution. Calculate the percent dissociation in 0.1 M solution.

92. The ionization constant of base is 5.4×10^{-4}. Calculate its degree of ionization in its 0.02 M solution.

93. The dissociation constant of a weak monobasic acid is 3.5×10^{-8}. Calculate its degree of dissociation in 0.05 M solution.

94. Calculate pH and pOH of 0.01 M HCl solution.

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95. pH of a solution is 3.12. Calculate the concentration of H_3O^+ ion.

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96. A weak monobasic acid is 0.04% dissociated in 0.025 M solution. What is pH of the solution?

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97. The pH of a solution is 6.06. Calculate the H^+ ion concentration.

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98. Calculate the pH of 0.01 M sulphuric acid.

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99. Calculate the pH of decimolar solution sulphuric add.

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100. In NaOH solution,$[OH]is2.87$ x 10^{-4}. Calculate the pH of the solution.

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101. pH of a weak monobasic acid is 3.2 in its 0.02 M solution. Calculate its dissociation constant.

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102. The pH of rain water collected in a certain region of Maharashtra on particular day was 5.1. Calculate the H+ ion concentration of the rain water and its percent dissodation.

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103. The pH of 0.02M ammonium hydroxide solution is 10.78. Calculate the hydroxyl ion concentration, degree of dissociation and dissociation constant.

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104. Calculate the pH of a solution obtained by mixing equal volumes of solutions with pH = 3 and pH=5.

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105. The value of K_w is 9.55×10^{-14} at a certain temperature. Calculate the pH of water at this temperature.

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106. Calculate the pH of buffer solution containing 0.05mol NaF per litre and 0.015 mol HF per litre. $\left[K_a = 7.2 \times 10^{-4} f \text{ or } HF \right]$.

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107. Calculate the pH of buffer solution composed of 0.1M weak base BOH and 0.2M of its salt BA. $\left[K_b = 1.8 \times 10^{-5} f \text{ or the } weak\text{base} \right]$

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108. Calculate the pH of a solution formed by mixing $0.2 M N H_4 C I$ and 0.1M $N H_4 O H$. The pK_b of $N H_4 O H$ is 4.75.

109. The solubility product of AgBr is 5.2×10^{-13}. Calculate its solubility in mol dm^{-3} and g dm^{-3} (Molar mass of $AgBr = 187.8 gmol^{-1}$)

110. Solubility product of AgCl is 1.8×10^{-10}. Calculate its molar solubility and solubility in g/L. Molar mass of AgCl is143.5 g mol^{-1}.

111. Solubilityproduct of $BaSO_4$ is 2.6×10^{-9}.Estimate its solubility.

112. The solubility product of $Fe(OH)_3$ at 298K is 1.1×10^{-36}. Find its solubility in $kgdm^{-3}$ at the same temperature. (Given: At Wts. Fe = 56, O =16, H =1).

113. The solubility product of barium sulphate is 1.21×10^{-11} at $25°C$. Calculate its solubility in $kgdm^{-3}$ at the same temperature.

114. The solubility product of Calcium Sulphate is 1×10^{-26}. Calculate its solubility.

115. Solubility product of $BaCO_3$ is 2.6×10^{-9}. Estimate its solubility.

116. A monobasic acid is 3% ionized in its 0.03 M aqueous solution. Calculate the dissociation constant of the acid

117. Calculate the degree of dissociation and concentration of H_3O^+ ion in 0.01 M solution of formic acid $K_a = 2.1 \times 10^{-4}$ at 298K.

118. A weak base BOH is 2.22 percent dissociated in its 0.1 M solution. Calculate the dissociation constant of the base.

119. Formicadd is12% dissodated in 0.05 Msolution. Evaluate the percent dissodated in 0.15 M solution.

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120. Calculate pH of 1.5×10^{-3} NaOH solution.

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121. Calculate the pH of 2.5×10^{-4} M HCl solution.

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122. Find the pH of solution containing 1.12×10^{-2} kg of potassium hydroxide in $2dm^3$ (mol. Wt. of KOH = 56)

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123. The pH of NH_4OH solution is 10.72 in 0.015 M solution. Calculate its dissoriation constant.

124. The concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3} M. What is its pH and nature of the soft drink.

125. The concentration of hydronium ions in a cup of black coffee is 1.3×10^{-5} M. Find the pH of the coffee. Is this coffee acidic or alkaline?

126. The pH of blood serum is 7.4. What is the hydrogen ion concentration of blood serum?

127. Calculate the pH of solution containing hydroxide ion concentration of 10^{-2} mol dm^{-3}.

128. A weak monoacidic base is 3% ionised at 298 K in its 0.05 M solution. Calculate the dissociation constant and pH of the solution.

129. Calculate the pH of buffer solution containing 0.05mol NaF per litre and 0.015 mol HF per litre. $\left[K_a = 7.2 \times 10^{-4} f \text{ or } HF\right]$.

130. The solubility of $BaSO_4$ at 298K is 0.003 g dm^{-3}. Calculate the solubility product of the salt assuming complete dissociation. $[Mol.\,Wt.\,of BaSO_4 = 233]$

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1. The pH of 10^{-5} M of HCl is.

A. 8

B. 7

C. less than 7

D. greater than 7

Answer:

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2. The solubility product of a sparingly soluble salt AX is 5.2×10^{-13}. Its solubility in mol dm^{-3} is

    A. 7.2×10^{-7}

    B. 1.35×10^{-4}

    C. 7.2×10^{-8}

    D. 13.5×10^{-8}

Answer:

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3. Blood in human body is highly buffered at pH of

    A. 7.4

    B. 7

    C. 6.9

    D. 8.1

Answer:

4. The conjugate base of $\left[Zn(H_2O)_4\right]^{2+}$ is

A. $\left[Zn(H_2O)_4\right]^{2-}NH_3$

B. $\left[Zn(H_2O)_3\right]^{2-}$

C. $\left[Zn(H_2O)_3OH\right]^{+}$

D. $[Zn(H_2O)]^{3+}$
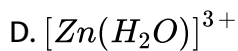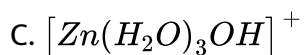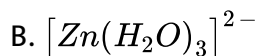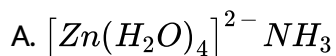
Answer:

5. For pH > 7 the hydronium ion concentrationWould be

A. $10^{-7}M$
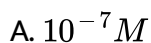
B. $< 10^{-7} M$

C. $> 10^{-7} M$

D. $\geq 10^{-7} M$

Answer:

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6. According to Ostwald's dilution law, the degree of dissociation of weak acid given by

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

B. $\sqrt{\dfrac{c}{K_a}}$

C. $\sqrt{\dfrac{K_a}{V}}$

D. $\sqrt{K_a C}$

Answer:

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7. The relation between pH and pOH is

    A. pH/pOH=14

    B. 14-pH=pOH

    C. $pH \times pOH = 14$

    D. $\dfrac{14}{p}OH = pH$

Answer:

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8. pH of a solution is 4. $\left[H^+\right]$ is

    A. $10^{-2}M$

    B. $\dfrac{1}{10^4}M$

    C. $10^{-6}M$

    D. 10^4M

Answer:

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9. The $[OH^-]$ of a solution is 1.0×10^{-10} M. The solution is

A. acidic

B. basic

C. neutral

D. none of the above

Answer:

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10. The pH of 3×10^{-4} M KOH is

A. 3.52

B. 10.48

C. 11.6

D. 7.5

Answer:

11. Na_2CO_3 is a salt of

A. strong acid and strong base
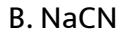
B. strong acid and weak base

C. weak acid and strong base

D. weak acid and weak base

Answer:
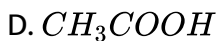
12. The solution of a salt is basic. The salt must be

A. KNO_3

B. NaCN

C. CH_3COONH_3

D. NH_4NO_3
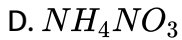
Answer:

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13. In $CH_3COO\dfrac{H}{C}H_3COONa$ buffer, the reserve acidity is due to

A. CH_3COO^-

B. Na^+

C. H^+

D. CH_3COOH
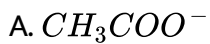
Answer:

14. The solubility of PbI_2, is related to its solubility product by the equation

A. $K_{sp} = S^2$

B. $K_{sp} = 4S^3$

C. $K_{sp} = 27S^4$

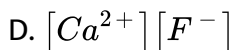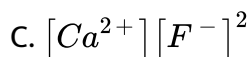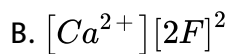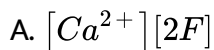D. $K_{sp} = 4S^2$

Answer:

15. The solubility product of CaF_2 is

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

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

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

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

Answer:

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16. If Na_2CO_3 is added to the solution of H_2CO_3, the pH of H_2CO_3 solution
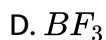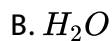
A. decreases

B. increases

C. remains constant

D. cannot be predicted

Answer:

17. Which of the following is least likely to behave as Lewis base?

A. OH^-

B. H_2O

C. NH_3

D. BF_3

Answer:

18. A monobasic weak acid solution has a molarity of 0.005 and pH of 5. What is its percentage ionisation in this solution?

A. 2.0.

B. 0.2

C. 0.5

D. 0.25

Answer:

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19. 0.023g of sodium metal reacted with $100cm^3$ of water. The pH of the resulting solution is

A. 10

B. 8

C. 9

D. 12

Answer:

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20. The concentration of hydronium ions in a cup of black coffee is 1.3×10^{-5} M. Find the pH of the coffee. Is this coffee acidic or alkaline?

A. 4.89

B. 3.89

C. 2.2

D. None of these

Answer:

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21. The pH of 10^{-3} M solution of NaOH is

A. 3

B. 11

C. 3

D. 12

Answer:

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22. The solubility product of $Mg(OH)_2$ is $4 \times 10^{-12}(molL^{-1})^3$. Solubility of $Mg(OH)_2$ is

    A. $4 \times 10^{-4}molL^{-1}$

    B. $1 \times 10^{-12}molL^{-1}$

    C. $1 \times 10^{-4}molL^{-1}$

    D. $2 \times 10^{-6}molL^{-1}$

Answer:

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23. When HCl gas is passed through a saturated solution of common salt, pure NaCl is predpitated because

A. the impurities dissolve in HCI

B. HCI is highly soluble in water

C. ionic product [Na+][CF] exceeds the solubility product of NaCl

D. the solubility product of NaCl is lowered by Cl" ions from aqueous

   HCI

Answer:

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24. Blood in human body is highly buffered at pH of
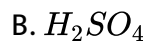
   A. 7.4

   B. 7

   C. 6.9

   D. 8.1

Answer:

25. The species which will behave both as conjugate acid and basic is

A. NH_4OH

B. H_2SO_4

C. CO^-

D. HSO_4^-

Answer:

26. Define molar solubility.

27. What is the relationship between molar solubility and solubility product for the salt Ag_2CrO_4?

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28. Define pH and pOH. Derive relationship between pH and pOH.

▶ **Watch Video Solution**

29. Calculate pH and pOH of 0.01 M HCl solution.

▶ **Watch Video Solution**

30. What is a Lewis acid? Illustrate with an example.

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31. Define ionic product of water. What is its value at 298 K and 273 K?

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32. What are the applications of buffer solutions?

> ▶ Watch Video Solution

33. Explain the mechanism of buffer action of an acidic buffer.

> ▶ Watch Video Solution

34. Explain with an example, salt of strong acid and strong base does not undergo hydrolysis.

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35. The pH of 0.02M ammonium hydroxide solution is 10.78. Calculate the hydroxyl ion concentration, degree of dissociation and dissociation constant.

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36. Explain the relation between ionic product and solubility product to predict whether a precipitate will form when two solutions are mixed?

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