EXERCISE-I (Conceptual Questions) — Build Up Your Understanding

INTRODUCTION

1. The formula weight of H_2SO_4 is 98. The weight of the acid in 400 mL of 0.1 M solution is :-
(1) 2.45 g (2) 3.92 g (3) 4.90 g (4) 9.8 g

2. Normality of 2 M sulphuric acid is :-
(1) 2 N (2) 4 N (3) N/2 (4) N/4

3. If pH = 3.31, then find out $[H^+]$ (Approxy)
(1) 3.39×10^{-4} (2) 5×10^{-4} (3) 3.0×10^{-3} (4) None

4. If $[OH^-] = 5.0\times10^{-5}$ M then pH will be :-
(1) 5 – log 5 (2) 9 + log 5 (3) log 5 – 5 (4) log 5 – 9

5. Basicity of H_3PO_3 and H_3PO_2 are respectively :-
(1) 1 and 2 (2) 2 and 3 (3) 3 and 2 (4) 2 and 1

6. Find out pH of solution having 2×10^{-3} moles of OH^- ions in 2 litre solution:-
(1) pH = 3 (2) pH = 3 + log2 (3) pH = 3 – log2 (4) pH = 11

7. pH of tomato juice is 4.4. Then concentration of H_3O^+ will be:-
(1) 39×10^{-4} (2) 3.9×10^{-5} (3) 3.9×10^{-4} (4) 3.9×10^{5}

8. 8 g NaOH is dissolved in one litre of solution, the molarity of the solution is:-
(1) 0.2 M (2) 0.4 M (3) 0.02 M (4) 0.8 M

9. The amount of acetic acid present in 100 mL of 0.1 M solution is :-
(1) 0.30 g (2) 3.0 g (3) 0.60 g (4) None

10. The number of milli equivalents of acid in 100 mL of 0.5 N HCl solution is :-
(1) 50 (2) 100 (3) 25 (4) 200

11. If the molar concentration of PbI_2 is 1.5×10^{-3} mol L^{-1}, the concentration of iodide ions in g ion L^{-1} is :-
(1) 3.0×10^{-3} (2) 6.0×10^{-3} (3) 0.3×10^{-3} (4) 0.6×10^{-6}

OSTWALD'S DILUTION LAW

12. Order of dissociation of 0.1 N CH_3COOH is :-
(1) 10^{-5} (2) 10^{-4} (3) 10^{-3} (4) 10^{-2}

13. If a is the degree of dissociation of weak dibasic organic acid and y is the hydrogen ion concentration, what is the initial concentration of acid :-
(1) $\frac{\alpha(y)^{-1}}{2}$ M (2) $y(\alpha)^{-1}$ M (3) $\frac{y(\alpha)^{-1}}{2}$ M (4) None of them

14. The degree of dissociation of acetic acid is given by the expression $\alpha = 0.1 \times C^{-1}$ (where C = concentration of the acid). What is the pH of the solution:-
(1) 1 (2) 2 (3) 3 (4) 4

15. Ostwald's dilution law is not applicable for strong electrolytes because:-
(1) Strong electrolytes are completely ionized
(2) Strong electrolytes are volatile
(3) Strong electrolytes are unstable
(4) Strong electrolytes often contain metal ions

16. The degree of ionization of a compound depends upon:
(1) Size of the solute molecules (2) Nature of the solute molecules
(3) Nature of the container (4) The amount of current passed

17. Find out K_a for 10^{-2} M HCN acid, having pOH is 10 :-
(1) $K_a = 10^{-4}$ (2) $K_a = 10^{-2}$ (3) $K_a = 10^{-5}$ (4) None of them

18. Which of the following will occur is a 1.0 M solution of a weak acid is diluted to 0.01 M at constant temperature:-
(1) Percentage ionization will increase (2) $[H^+]$ will decrease to 0.01 M
(3) K_a will increase (4) pH will decrease by 2 units

19. The pH of 0.15 M solution of HOCl ($K_a = 9.6\times10^{-6}$) is :-
(1) 4.42 (2) 2.92 (3) 3.42 (4) None

20. The extent of ionization increases (weak electrolytes)
(1) With the increase in concentration of solute
(2) On decreasing the temperature of solution
(3) On addition of excess of water to the solution
(4) On stirring the solution vigorously

21. If K_a of HCN = 4×10^{-10}, then the pH of 2.5×10^{-1} molar HCN (aq) is:-
(1) 4.2 (2) 4.7 (3) 0.47 (4) 5.0

22. The molarity of nitrous acid at which its pH becomes 2. ($K_a = 4.5\times10^{-4}$)
(1) 0.3333 (2) 0.4444 (3) 0.6666 (4) 0.2222

23. Correct statement for HCN weak acid at 25°C temperature. :-
(1) $\alpha = \frac{K_a}{[H^+]}$ (2) $\alpha = \frac{K_a \times [OH^-]}{K_w}$
(3) (1) & (2) both (4) $K_b = C\alpha^2$

EXPLANATION OF WATER

24. Ionic product of water will increase, if :-
(1) Dissociation the pressure (2) Add H^+
(3) Add OH^- (4) Increase the temperature

25. For water at 25ºC, 2×10^{-7} moles per litre is the correct answer for which one of the following

(1) $[H^+] + [OH^-]$ (2) $[H^+]^2$ (3) $[OH^-]^2$ (4) $[H^+] - [OH^-]$

26. At 25°C, the dissociation constant for pure water is given by :-

(1) $(55.4\times10^{14})^{-1}$ (2) 1×10^{-14} (3) $\frac{1\times10^{-14}}{18}$ (4) None of these

27. Ionic product of water is equal to:-
(1) Dissociation constant of water × $[H_2O]$
(2) Dissociation constant of water × $[H^+]$
(3) Product of $[H_2O]$ and $[H^+]$
(4) Product of $[OH^-]^2$ and $[H^+]$

28. Addition of H^+ and OH^- ion's concentration at 90°C
(1) 10^{-14} (2) 10^{-12} (3) 2×10^{-6} (4) 10^{-7}

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

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

31. The common ion effect is shown by which of the following sets of solutions :-
(1) $BaCl_2 + Ba(NO_3)_2$ (2) NaCl + HCl
(3) $NH_4OH + NH_4Cl$ (4) None

32. Basic strength of NH_4OH in presence of NH_4Cl
(1) Increases
(2) Remains unchanged
(3) Decreases
(4) Sometimes increases or sometimes decreases

33. Which of the following is a true statement:
(1) The ionization constant and ionic product of water are same.
(2) Water is a strong electrolyte
(3) The value of ionic product of water is less than that of its ionisation constant.
(4) At 298 K, the number of H^+ ions in a litre of water is 6.023×10^{16}.

34. If it is known that H_2S is a weak acid and it is ionized into $2H^+$ and S^{-2}. Then in this solution HCl is added so, pH becomes less, then what will happen:-
(1) Decrease in S^{-2} ion concentration (2) Concentration of S^{-2} is not affected
(3) Increase in S^{-2} ion concentration (4) It is not possible, to add HCl in solution

SALTS, TYPES OF SALT & CONJUGATE TEHORY

35. Which of the following is not an acidic salt:-
(1) $NaHSO_4$ (2) HCOONa (3) NaH_2PO_3 (4) None of them

36. Which is a basic salt :-

(1) PbS (2) $PbCO_3$ (3) $PbSO_4$ (4) $2PbCO_3\ Pb(OH)_2$

37. The process of neutratlisation invariably results in the production of :-
(1) H^+ ions (2) OH^- ions
(3) Both H^+ and OH^- (4) Molecules of water

38. Which of the following is an acid salt :-
(1) Na_2S (2) Na_2SO_3 (3) $NaHSO_3$ (4) Na_2SO_4

39. The mixed salt among the following is :-
(1) $\begin{matrix} CH(OH)COONa \\ | \\ CH(OH)COONa \end{matrix}$ (2) $NaKSO_4$
(3) $CaCl_2$ (4) All

HYDROLYSIS OF SALTS

40. At 90°C, the pH of 0.1 M NaCl aqueous solution
(1) < 7 (2) > 7 (3) 7 (4) 0.1

41. What will be the pH of 1.0 M ammonium format solution, If $K_a = 1\times10^{-5}$:-
(1) 6.5 (2) 7.5 (3) 8.0 (4) 9.0

42. Which salt will not undergo hydrolysis :-
(1) KCl (2) Na_2SO_4 (3) NaCl (4) All

43. Maximum efficiency of cationic hydrolysis will be shown by :-
(1) Al^{+3} (2) Ga^{+3} (3) Tl^{+1} (4) Tl^{+3}

44. $HCOO^- + H_2O \rightleftharpoons HCOOH + OH^-$ is related :-
(1) $h = \sqrt{K_h}$ (2) $h = \sqrt{\frac{K_h}{C}}$ (3) $h = \sqrt{\frac{K_h}{V}}$ (4) $K_h = \sqrt{hc}$

45. The pH of aqueous solution of sodium acetate is :-
(1) 7 (2) Very low (3) > 7 (4) < 7

46. If pK_b for CN^- at 25°C is 4.7. The pH of 0.5 M aqueous NaCN solution is :-
(1) 12 (2) 10 (3) 11.5 (4) 11

47. The highest pH value is of :-
(1) 0.1 M NaCl (2) 0.1 M NH_4Cl
(3) 0.1 M CH_3COONa (4) 0.1 M CH_3COONH_4

48. pH of K_2S solution is :-
(1) 7 (2) Less than 7 (3) More than 7 (4) 0

49. For anionic hydrolysis, pH is given by :-

(1) $pH = \frac{1}{2}pK_W - \frac{1}{2}pK_b - \frac{1}{2}\log c$ (2) $pH = \frac{1}{2}pK_W - \frac{1}{2}pK_a - \frac{1}{2}pK_b$

(3) $pH = \frac{1}{2}pK_W - \frac{1}{2}pK_a - \frac{1}{2}\log c$ (4) None of above

50. A weak acid react with strong base, ionization constant of weak acid is 10^{-4}. Find out equilibrium constant for this reaction :-

(1) 10^{-10} (2) 10^{10} (3) 10^{-9} (4) 10^{9}

51. Hydroxyl ion concentration $[OH^-]$ in the case of sodium acetate can be expressed as (where K_a is dissociation constant of CH_3COOH and C is the concentration of sodium acetate):-

(1) $[OH^-] = (CK_w.K_a)^{1/2}$ (2) $[OH^-] = C.K_w\sqrt{K_a}$

(3) $[OH^-] = \left(\frac{C.K_w}{K_a}\right)^{1/2}$ (4) $[OH^-] = C.K_a.K_w$.

52. Consider :-

(a) $FeCl_3$ in water – Basic (b) NH_4Cl in water –Acidic

(c) Ammonium acetate in water –Acidic (d) Na_2CO_3 in water - Basic

(1) b and d (2) b only (3) a and c (4) d only

53. Which of the following salts undergoes hydrolysis in water :-

(1) Na_3PO_4 (2) CH_3COONa (3) $NaNO_3$ (4) Both of (1) and (2)

54. A salt 'X' is dissolved in water of pH = 7. The resulting solution becomes alkaline in nature. The salt is made up of :-

(1) A strong acid and strong base (2) A strong acid and weak base

(3) A weak acid and weak base (4) A weak acid and strong base

55. K_a for cyano acetic acid is 3.5×10^{-3}. Then the degree of hydrolysis of 0.05M sodium cyano acetate solution will have the following value :-

(1) 4.559×10^{-6} (2) 5.559×10^{-6} (3) $6.559\times10^{-6+}$ (4) 7.559×10^{-6}

56. Degree of Hydrolysis of $\frac{N}{100}$ solution of KCN is

(Given Ka = 1.4×10^{-9})

(1) 2.7×10^{-3} (2) 2.7×10^{-2} (3) 2.7×10^{-4} (4) 2.7×10^{-5}

SOLUBILITY & SOLUBILITY PRODUCT (K_{sp})

57. The solubility product of sparingly soluble univalent salt is defined as the product of ionic concentration in a :-

(1) 1 M solution (2) Concentration solution

(3) Very dilute solution (4) Saturated solution

58. In solubility of salts M_2X, QY_2 and PZ_2 equal, then the relation between their K_{sp} will be :-

(1) $K_{sp}(M_2X) > K_{sp}(QY_2) > K_{sp}(PZ_2)$ (2) $K_{sp}(M_2X) = K_{sp}(QY_2) < K_{sp}(PZ_2)$

(3) $K_{sp}(M_2X) > K_{sp}(QY_2) = K_{sp}(PZ_2)$ (4) $K_{sp}(M_2X) = K_{sp}(QY_2) = K_{sp}(PZ_2)$

59. The expression of solubility product of mercurous iodide is :-
(1) $[2\ Hg^{+}]^2 \times 2[I^{-}]^2$ (2) $[Hg^{++}]^2 \times [2I^{-}]^2$
(3) $[\ Hg_2^{2+}\ ] \times [I^{-}]^2$ (4) $[Hg^{2+}]^2 \times [I^{-}]^2$

60. At 25°C, the K_{sp} value of AgCl is 1.8×10^{-10}. If 10^{-5} moles of Ag^{+} are added to solution then K_{sp} will be :-
(1) 1.8×10^{-15} (2) 1.8×10^{-10} (3) 1.8×10^{-5} (4) $1.8\times10^{+10}$

61. At 25°C, required volume of water, to dissolve 1 g $BaSO_4$ ($K_{sp} = 1.1\times10^{-10}$) will be (Molecular weight of $BaSO_4$ = 233)
(1) 820 L (2) 1 L (3) 205 L (4) 430 L

62. Concentration of Ag^{+} ions in saturated solution of Ag_2CrO_4 at 20°C is 1.5×10^{-4} mol L^{-1}. At 20°C, the solubility product of Ag_2Cr_4 is :-
(1) 3.3750×10^{-12} (2) 1.6875×10^{-10} (3) 1.68×10^{-12} (4) 1.6875×10^{-11}

63. How many grams of CaC_2O_4 will dissolve in distilled water to make one litre saturated solution? Solubility product of CaC_2O_4 is 2.5×10^{-9} $mol^2\ L^{-2}$ and its molecular weight is 128.
(1) 0.0064 g (2) 0.0128 g (3) 0.0032 g (4) 0.0640 g

64. If the concentration of CrO_4^{2-} ion in a saturated solution of silver chromate will be 2×10^{-4} M, solubility product of silver chromate will be -
(1) 4×10^{-8} (2) 8×10^{-12} (3) 32×10^{-12} (4) 6×10^{-12}

65. If the solubility of AgCl (formula mass = 143) in water at 25°C is 1.43×10^{-4} g/100 mL of solution then the value of K_{sp} will be :-
(1) 1×10^{-5} (2) 2×10^{-5} (3) 1×10^{-10} (4) 2×10^{-10}

66. If the salts M_2X, QY_2 and PZ_3 have the same solubilities, their K_{sp} values are related as- (S < 1)
(1) $K_{sp}(M_2X) = K_{sp}(QY_2) < K_{sp}(PZ_3)$ (2) $K_{sp}(M_2X) > K_{sp}(QY_2) = K_{sp}(PZ_3)$
(3) $K_{sp}(M_2X) = K_{sp}(QY_2) > K_{sp}(PZ_3)$ (4) $K_{sp}(M_2X) > K_{sp}(QY_2) > K_{sp}(PZ_3)$

67. The solubility product of As_2S_3 is given by the expression :-
(1) $K_{sp} = [As^{3+}] \times [S^{-2}]$ (2) $K_{sp} = [As^{3+}]^1 \times [S^{-2}]^1$
(3) $K_{sp} = [As^{3+}]^3 \times [S^{-2}]^2$ (4) $K_{sp} = [As^{3+}]^2 \times [S^{-2}]^3$

68. If the solubility of $PbBr_2$ is 'S' g molecules per litre, considering 100% ionization its solubility product is :-
(1) $2S^3$ (2) $4S^2$ (3) $4S^3$ (4) $2S^4$

69. If the solubility of lithium sodium hexeafluoro aluminate $Li_3Na_3(AlF_6)_2$ is 'S' mol L^{-1}. Its solubility product is equal to :-
(1) S^8 (2) 12 S^3 (3) 18 S^3 (4) 2916 S^8

70. One litre of saturated solution of $CaCO_3$ is evaporated to dryness, when 7.0 g og residue is left. The solubility product for $CaCO_3$ is:-
(1) 4.9×10^{-3} (2) 4.9×10^{-5} (3) 4.9×10^{-9} (4) 4.9×10^{-7}

APPLICATION OF SOLUBILITY PRODUCT (K_{sp})

71. At 30°C, In which of the one litre solution, the solubility of Ag_2CO_3 (solubility product = 8×10^{-12}) will be maximum :-
(1) 0.05 M Na_2CO_3 (2) Pure water
(3) 0.05 M $AgNO_3$ (4) 0.05 M NH_3

72. Solubility of AgBr will be minimum in :-
(1) Pure water (2) 0.1 M $CaBr_2$ (3) 0.1 M NaBr (4) 0.1 M $AgNO_3$

73. In which of the following, the solution of AgSCN will be unsaturated :-
(1) $[Ag^+] \times [SCN^-] = K_{sp}$ (2) $[Ag^+] \times [SCN^-] < K_{sp}$
(3) $[Ag^+] \times [SCN^-] > K_{sp}$ (4) $[Ag^+] \times [SCN^-]^{-2} < K_{sp}$

74. Correct order of solubility product is :-
(1) $CaCrO_4 > SrCrO_4 > BaCrO_4$ (2) $BaCrO_4 > SrCrO_4 > CaCrO_4$
(3) $CaCrO_4 > BaCrO_4 > SrCrO_4$ (4) $SrCrO_4 > BaCrO_4 > CaCrO_4$

75. If 's' and 'S' are respectively solubility and solubility product of a sparingly soluble binary electrolyte then :-
(1) $s = S$ (2) $s = S^2$ (3) $s = S^{1/2}$ (4) $s = \frac{1}{2}S$

76. The solubility product of CuS, Ag_2S and HgS are 10^{-37}, 10^{-44} and 10^{-54} respectively. The solubility of these sulphides will be in the order
(1) $HgS > Ag_2S > CuS$ (2) $Ag_2S > HgS > CuS$
(3) $CuS > Ag_2S > HgS$ (4) $Ag_2S > CuS > HgS$

77. If the maximum concentration of $PbCl_2$ in water is 0.01 m at 298 K, Its maximum concentration in 0.1 M NaCl will be:-
(1) 4×10^{-3} M (2) 0.4×10^{-4} M (3) 4×10^{-2} (4) 4×10^{-4} M

78. M_2SO_4 (M^+ is monovalent metal ion) has a K_{sp} of 1.2×10^{-5} at 298 K. The maximum concentration of M^+ ion that could be attained in a saturated solution of this solid at 298 K is :-
(1) 3.46×10^{-3} M (2) 2.89×10^{-2} M (3) 2.8×10^{-3} M (4) 7.0×10^{-3} M

79. Which of the following has maximum solubility (K_{sp} value is given in brackets) :-
(1) HgS (1.6×10^{-54}) (2) $PbSO_4$ (1.3×10^{-8})
(3) ZnS(1.2×10^{-28}) (4) MnS (1.4×10^{-10})

80. Maximum soluble is :- (K_{sp} is given)
(1) CuS (8.5×10^{-36}) (2) CdS (3.6×10^{-28}) (3) ZnS (1.2×10^{-28}) (4) MnS (1.4×10^{-10})

81. In which of the following, the solubility of AgCl will be maximum

(1) 0.1 M $AgNO_3$ (2) Water (3) 0.1 M NaCl (4) 0.1 M KCl

82. The solubility product of three sparingly soluble salts are given below :

No.	Formula	Solubility product
1.	PQ	4.0×10^{-20}
2.	PQ_2	3.2×10^{-14}
3.	PQ_3	2.7×10^{-35}

The correct order of decreasing molar solubility is :-

(1) 1, 2, 3 (2) 2, 1, 3 (3) 3, 2, 1 (4) 2, 3, 1

83. K_{sp} value is more for :-

(1) CuS (2) NiS (3) PbS (4) CdS

84. The K_{sp} value for $Gd(OH)_3$ is 2.8×10^{-23}, the pH at which $Gd(OH)_3$ begins to precipitate is :-

(1) 6.08 (2) 5.08 (3) 8.47 (4) 4.08

85. If the solubility product $AgBrO_3$ and Ag_2SO_4 are 5.5×10^{-5} and 2×10^{-5} respectively, the relationship between the solubilities of these can be correctly represented as:-

(1) $sAgBrO_3 > sAg_2SO_4$ (2) $sAgBrO_3 = sAg_2SO_4$

(3) $sAgBrO_3 < sAg_2SO_4$ (4) Can't predict

86. 0.5 M HCl solution has ions Hg^{++}, Cd^{++}, Sr^{++}, Fe^{++}, Cu^{++}. To pass the H_2S gas in this solution, which are precipitated out :-

(1) Cd^{+2}, Fe^{+2}, Sr^{+2} (2) Cd^{+2}, Hg^{+2}, Cu^{+2}

(3) Hg^{+2}, Cu^{+2}, Fe^{+2} (4) Cu^{+2}, Sr^{+2}, Fe^{+2}

87. Solubility product of $Mg(OH)_2$ is 1×10^{-11}. At what pH, precipitation of $Mg(OH)_2$ will begin from 0.1 M Mg^{2+} solution :-

(1) 9 (2) 5 (3) 3 (4) 7

88. In the qualitative analysis of group III, $Fe(OH)_2$ is not precipitated because :-

(1) The K_{sp} for $Fe(OH)_2$ is higher

(2) To precipitate $Fe(OH)_2$, only small $[OH^-]$ is needed

(3) $Fe(OH)_2$ is a weak electrolyte

(4) The oxidation state of Fe in $Fe(OH)_2$ is +2.

89. A solution, containing 0.01 M Zn^{+2} and 0.01 M Cu^{2+} is saturated by passing H_2S gas. The S^{-2} concentration is 8.1×10^{-21}M, Ksp for ZnS and CuS are 3.0×10^{-22} and 8.0×10^{-36} respectively. Which of the following will occur in the solution :-

(1) ZnS will precipitate (2) CuS will precipitate

(3) Both ZnS and CuS will precipitate (4) Both Zn^{2+} and Cu^{2+} will remain in the solution

90. Consider (i) $Zn(OH)_2$ (ii) $Cr(OH)_3$ (iii) $Mg(OH)_2$ (iv) $Al(OH)_3$ which hydroxide is precipitated by NH_4OH containing NH_4Cl :-

(1) i, ii (2) ii, iv (3) only iv (4) i, ii, iii and iv

91. What will happen if the pH of the solution of 0.001 M $Mg(NO_3)$ solution is adjusted to pH = 9 (K_{sp} $Mg(OH)_2 = 8.9\times10^{-12}$)
(1) ppt will take place (2) ppt will not take place
(3) Solution will be saturated (4) None of these

92. The solubility product constant Ksp of $Mg(OH)_2$ is 9.0×10^{-12}. If a solution is 0.010 M with respect to Mg^{2+} ion, what is the maximum hydroxide ion concentration which could be present without causing the precipitation of $Mg(OH)_2$:-
(1) 1.5×10^{-7} M (2) 3.0×10^{-7} M (3) 1.5×10^{-5} M (4) 3.0×10^{-5} M

93. When HCl gas is passed through a saturated solution of common salt, pure NaCl is precipitated because :-
(1) The impurities dissolve in HCl
(2) HCl is slightly soluble in water
(3) The ionic product $[Na^+] \times [Cl^-]$ exceeds the solubility product of NaCl
(4) The solubility product of NaCl is lowered by Cl^- from aq. HCl

94. A solution is a mixture of 0.06 M KCl and 0.06 M KI. $AgNO_3$ solution is being added drop by drop till AgCl starts precipitating (K_{sp} AgCl = 1×10^{-10} and K_{sp} AgI = 4×10^{-16}). The concentration of Iodide ion at this stage will be nearly equal to :-
(1) 4.0×10^{-5} M (2) 2.4×10^{-7} M (3) 2.0×10^{-8} M (4) 4×10^{-8} M

95. Why only As^{3+} gets precipitated as As_2S_3 and not Zn^{2+} as ZnS when H_2S is passed through an acidic solution containing As^{3+} and Zn^{2+} :-
(1) Enough As^{3+} are present in acidic medium
(2) Zinc salt does not ionise in acidic medium
(3) Solubility product of As_2S_3 is less than that of ZnS
(4) Solubility product changes in presence of an acid

96. H_2S is passed through a solution of cations in HCl medium to precipitate cation of :-
(1) II-A group of cation analysis (2) II-B group of cation analysis
(3) IV group of caiton analysis (4) Both II-A and II-B gps

97. To have more sulphide ion concentration, H_2S should be passed through :-
(1) 1 N HCl solution (2) 0.1 N HCl solution
(3) A neutral solution such as water (4) An ammonical soluiton

98. The solubility product of hydroxides of Mg^{+2}, Zn^{+2} and Fe^{+3} decreases as K_{sp} $Mg(OH)_2 > K_{sp}$ $Zn(OH)_2 > K_{sp}$ $Fe(OH)_3$. The order of precipitation of hydroxides is :-
(1) $Fe(OH)_3$, $Zn(OH)_2$, $Mg(OH)_2$ (2) $Mg(OH)_2$, $Zn(OH)_2$, $Fe(OH)_3$
(3) $Zn(OH)_2$, $Fe(OH)_3$, $Mg(OH)_2$ (4) $Zn(OH)_2$, $Mg(OH)_2$, $Fe(OH)_3$

FEW IMPORTANT POINTS

99. Two monobasic weak acids have the same concentration of H^+ ions. What is the relationship between dissociation constant and dilution.
(1) $Ka_1 V_1 = Ka_2 V_2$ (2) $Ka_1 V_2 = Ka_2 V_1$
(3) $[Ka_1 V_2]^{1/2} = Ka_2 V_2$ (4) $Ka_1 V_1 = [Ka_2 V_2]^{1/2}$

100. What is the molar concentration of chloride ion in the solution obtained by mixing 300 mL of 3.0 M NaCl and 200 mL of 4.0 M solution of $BaCl_2$:-
(1) 5.0 M (2) 1.8 M (3) 1.6 M (4) None of these

101. The pH of a 0.1 M formic acid 0.1 % dissociated is equal to 4. What will be the pH of another weak monobasic acid (same concentration) which is 1% dissociated.
(1) 2 (2) 3 (3) 1 (4) 4

pH

102. pH of water is 7. When any substance Y is dissolved in water then pH becomes 13. Substance Y is a salt of :
(1) Strong acid and strong base (2) Weak acid and weak base
(3) Strong acid and weak base (4) Weak acid and strong base

103. Minimum pH is shown by aqueous solution of :-
(1) 0.1 M $BaCl_2$ (2) 0.1 M $Ba(NO_3)_2$ (3) 0.1 M $BeCl_2$ (4) 0.1 M $Ba(OH)_2$

104. Given :-
(a) 0.005 M H_2SO_4 (b) 0.1 M Na_2SO_4
(c) 10^{-2} M NaOH (d) 0.01 M HCl
Choose the correct code having same pH :-
(1) a, c, d (2) b, d (3) a, d (4) a, c

105. What is H^+ ion concentration of 5×10^{-3} M H_2CO_3 solution having a 10% dissociation :-
(1) 10^{-3} (2) 10^{-2} (3) 10^{-1} (4) 5×10^{-2}

106. A metal hydroxide of molecular formula $M(OH)_4$ is 50% ionized. Its 0.0025 M solution will have the pH :-
(1) 12 (2) 2 (3) 4 (4) 11.7

107. In the following solution, the concentration of different acids are give, which mixture of the acid has highest pH :-
(1) $\frac{M}{10}H_2SO_4$, $\frac{M}{20}HNO_3$, $\frac{M}{10}HClO_4$ (2) $\frac{M}{20}$ H_2SO_4, $\frac{M}{10}HNO_3$, $\frac{M}{20}HClO_4$
(3) $\frac{M}{20}$ H_2SO_4, $\frac{M}{10}HNO_3$, $\frac{M}{40}HClO_4$ (4) $\frac{M}{20}$ H_2SO_4, $\frac{M}{5}HNO_3$, $\frac{M}{5}HClO_4$

108. If 100 mL of pH = 3 and 400 mL of pH = 3 is mixed, what will be the pH of the mixture
(1) 3.2 (2) 3.0 (3) 3.5 (4) 2.8

109. 10^{-6} M HCl is diluted to 100 times. Its pH is :-
(1) 6.0 (2) 8.0 (3) 6.95 (4) 9.5

110. pH of 0.001 M acetic acid would be :-
(1) 2 (2) > 3 (3) 7 (4) 14

111. At 90°C, the pH of 0.001 M KOH solution will be :-

(1) 3 (2) 11 (3) 5 (4) 9

112. The pH of solution is increased from 3 to 6. Its H^+ ion concentration will be :-
(1) Reduced to half (2) Doubled
(3) Reduced by 1000 times (4) Increased by 1000 times

113. A solution has pOH equal to 13 at 298 K. The solution will be :-
(1) Highly acidic (2) Highly basic
(3) Moderately basic (4) Unpredictable

114. The pH of the solution containing 10 mL of a 0.1 M NaOH and 10 mL of 0.05 M H_2SO_4 would be
(1) Zero (2) 1 (3) > 7 (4) 7

115. Which of the following statements are (is) 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 increase with temperature.
(d) When a solution of a weak monoprotic acid is titrated against a strong base, at half neutralization point pH = 1/2 pKa.
(1) a (2) a, b (3) a, b, d (4) b, c

116. In a solution of pH = 5, more acid is added in order to reduce the pH = 2. The increase in hydrogen ion concentration is :-
(1) 100 times (2) 1000 times (3) 3 times (4) 5 times

117. The hydrogen ion concentration in a given solution is 6×10^{-4} M. Its pH will be :-
(1) 6 (2) 3.22 (3) 4 (4) 2

118. The pOH or beer is 10.0. The hydrogen ion concentration will be :-
(a) 10^{-10} (b) $\frac{Kw}{10^{-10}}$ (c) $\frac{Kw}{10^{-8}}$ (d) 10^{-4}
(1) a, d (2) b, c (3) a, b, c (4) None

119. An aqueous solution whose pH = 0 is :-
(1) Basic (2) Acidic (3) Neutral (4) Amphoteric

120. The pH of the solution produced when an aqueous solution of strong acid pH 5 is mixed the equal volume of an aqueous solution of strong acid of pH 3 is.
(1) 3.3 (2) 3.5 (3) 4.5 (4) 4.0

121. Following five solution of KOH were prepare as –
First → 0.1 moles in 1 L
Second → 0.2 moles in 2 L
Third → 0.3 moles in 3 L
Fourth → 0.4 moles in 4 L

Fifth → 0.5 moles in 5 L

The pH of resultant solution is :-

(1) 2 (2) 1 (3) 13 (4) 7

122. The pH of a 0.02 M ammonia solution which is 5% ionized will be :-

(1) 2 (2) 11 (3) 5 (4) 7

123. For $\frac{N}{10}$ H_2SO_4, pH value is :-

(1) 1 (2) 0.586 (3) 0.856 (4) None

124. An aqueous solution of HCl is 10^{-9} M HCl. The pH of the solution should be :-

(1) 9 (2) Between 6 and 7 (3) 7 (4) Unpredictable

125. H_2X is a dibasic acid which dissociates completely in water. Which one of the following is the molarity of an aqueous solution of this acid which has a pH of 1 :-

(1) 0.1 (2) 0.05 (3) 0.2 (4) 0.5

126. How many moles of HCl must be removed form 1 litre of aqueous HCl solution to change its pH from 2 to 3 :-

(1) 1 (2) 0.02 (3) 0.009 (4) 0.01

127. 8 g NaOH and 4.9 g H_2SO_4 are present in one litre of the solution. What is its pH

(1) 1 (2) 13 (3) 12 (4) 2

128. Calculate pH of a solution whose 100 mL contains 0.2 g NaOH dissolved in it :-

(1) 10.699 (2) 11.699 (3) 12.699 (4) 13.699

129. One litre solution contains 1 M HOCl [$K_a = 10^{-8}$] and 1 M NaOH. What is the pH of the solution :-

(1) 8 (2) 11 (3) 5 (4) 2

130. What is the quantity of NaOH present in 250 cc of the solution, so that it gives a pH = 13 :-

(1) 10^{-13} g (2) 10^{-1} g (3) 1.0 g (4) 4.0 g

131. 0.001 mol of the strong electrolyte $M(OH)_2$ has been dissolved to make a 20 mL of its saturated solution. Its pH will be :- [$K_w = 1\times10^{-14}$]

(1) 13 (2) 3.3 (3) 11 (4) 9.8

132. Choose the wrong statement :-

(1) For a neutral solution : $[H^+] = [OH^-] = \sqrt{K_w}$

(2) For an acidic solution :$[H^+] > \sqrt{K_w}$ and $[OH^-] < \sqrt{K_w}$

(3) For a basic solution : $[H^+] < \sqrt{K_w}$ and $[OH^-] > \sqrt{K_w}$

(4) For a neutral solution at all temperatures $[H^+] = [OH^-] = 10^{-7}$ M

133. The pH of 0.1 M solution of the following salts increases in order :-

(1) $NaCl < NH_4Cl < NaCN < HCl$ (2) $NaCN < NH_4Cl < NaCl < HCl$
(3) $HCl < NaCl < NaCN < NH_4Cl$ (4) $HCl < NH_4Cl < NaCl < NaCN$

BUFFER SOLUTIONS AND INDICATOR

134. In a buffer solution the ratio of concentration of NH_4Cl and NH_4OH is 1 : 1 when it changes in 2 : 1 what will be the value of pH of buffer :-
(1) Increase (2) Decrease (3) No effect (4) N.O.T.

135. To a 50 mL of 0.05 M formic acid how much volume of 0.10 M sodium format must be added to get a buffer solution of pH = 4.0? (pK_a of the acid is 3.8)
(1) 50 mL (2) 4 mL (3) 100 mL (4) 39.6 mL

136. In the volumetric estimation of HCl, if we make use of phenolphthalein as an indicator, which base is unsuitable for the titration :-
(1) NaOH (2) RbOH (3) KOH (4) NH_4OH

137. In a mixture of weak acid and its salt, the ratio of concentration of acid to salt is increased tenfold. The pH of the solution :-
(1) Decreases by one (2) Increases by one-tenth
(3) Increases by one (4) Increases tenfold

138. pK_b for NH_4OH at certain temperature is 4.74. The pH of basic buffer containing equimolar concentration of NH_4OH and NH_4Cl will be :-
(1) 7.74 (2) 4.74 (3) 2.37 (4) 9.26

139. What is the suitable indicator for titration of NaOH and oxalic acid:-
(1) Methyl orange (2) Methyl red
(3) Phenolphthalein (4) Starch solution

140. Phenolphthalein does not act as an indicator for the titration between :-
(1) KOH and H_2SO_4 (2) NaOH and CH_3COOH
(3) Oxalic acid and $KMnO_4$ (4) $Ba(OH)_2$ and HCl

141. Which can act as buffer :-
(1) NH_4OH + NaOH
(2) HCOOH + CH_3COONa
(3) 40 mL 0.1 M NaCn + 20 mL of 0.1 M HCl
(4) None of them

142. The buffer solution play an important role in:-
(1) Increasing the pH value (2) Decreasing the pH value
(3) Keeping the pH constant (4) Solution will be neutral

143. Ka for HCN is 5×10^{-10} at 25°C. For maintaining a constant pH of 9, the volume of 5 M KCN solution required to be added to 10 mL of 2 M HCN solution is -
(1) 4 mL (2) 7.95 mL (3) 2 mL (4) 9.3 mL

144. Buffering action of a mixture of CH_3COOH and CH_3COONa is maximum when the ratio of salt to acid is equal to -
(1) 1.0 (2) 100.0 (3) 10.0 (4) 0.1

145. The pink colour of phenolphthalein in alkaline medium is due to -
(1) Negative ion (2) Positive ion (3) OH^- ions (4) Neutral form

146. Which indicator works in the pH range 8 – 9.8
(1) Phenolphthalein (2) Methyl orange
(3) Methyl red (4) Litmus

147. A basic – buffer will obey the equation $pOH - pK_b = 1$ only under condition :-
(1) [Conjugate acid] : [base] = 1 : 10 (2) [Conjugate acid] = base
(3) [Conjugate acid] : [base] = 10 : 1 (4) N.O.T

148. For weak acid strong base titration, the indicator used is :-
(1) Potassium di-chromate (2) Methyl orange
(3) Litmus (4) Phenolphthalein

149. From the following in which titration methyl orange is a best indicator :-
(1) $CH_3COOH + NaOH$ (2) $H_2C_2O_4 + NaOH$
(3) $HCl + NaOH$ (4) $CH_3COOH + NH_4OH$

150. The total number of different kind of buffers obtained during the titration of H_3PO_4 with NaOH are :-
(1) 3 (2) 1 (3) 2 (4) 0

151. The H^+ ion concentration in 0.001 M acetic acid is 1.34×10^{-4} g ion L^{-1}. The H^+ ion concentration of 0.164 g of CH_3COONa is added to a litre of 0.001 M CH_3COOH will be :-
(1) 9×10^{-6} (2) 18×10^{-6} (3) 4.5×10^{-6} (4) 5×10^{-6}

152. A certain acidic buffer solution contains eqaul concentration of X^- and HX. The K_b for X^- is 10^{-10}. The pH of the buffer is :-
(1) 4 (2) 7 (3) 10 (4) 14

153. When 1.0 mL of dil. HCl acid is added to 100 mL of a buffer solution of pH 4.0. The pH of the solution
(1) Becomes 7 (2) Does not change (3) Becomes 2 (4) Becomes 10

154. The pH of blood is maintained by CO_2 and H_2CO_3 in the body and chemical constituents of blood. This phenomenon is called :-
(1) Colloidal (2) Buffer action (3) Acidity (4) Salt balance

155. Phenolphthalein is not a good indicator for titrating
(1) NaOH against oxalic acid (2) NaOH against HCl
(3) NaOH against H_2SO_4 (4) Ferrous sulphate against $KMnO_4$

156. Which of the following solutions does not act as buffer :-
(1) $H_3PO_4 + NaH_2PO_4$ (2) H_3PO_4
(3) NH_4Cl (4) $CH_3COOH + CH_3COONa$

157. 50 mL of 2N acetic acid mixed with 10 mL of 1N sodium acetate solution will have an approximate pH of ($K_a = 10^{-5}$) :-
(1) 4 (2) 5 (3) 6 (4) 7

158. On addition of NaOH to CH_3COOH solution, 60% of the acid is neutralized. If pK_a of CH_3COOH is 4.7 then the pH of the resulting solution is :-
(1) More than 4.7 but less than 5.0 (2) Less than 4.7 but more than 4.0
(3) More than 5.0 (4) Remains unchanged

160. Half of the formic acid solution is neutralized on addition of a KOH solution to it. If K_a (HCOOH) = 2×10^{-4} then pH of the solution is ; (log 2 = 0.3010)
(1) 3.6990 (2) 10.3010 (3) 3.85 (4) 4.3010

161. A solution contains 0.2 M NH_4OH and 0.2 M NH_4Cl. If 1.0 mL of 0.001 M HCl is added to it. What will be the $[OH^-]$ of the resulting solution [$K_b = 2\times10^{-5}$]
(1) 2×10^{-5} (2) 5×10^{-10} (3) 2×10^{-3} (4) None of these

162. Hunderson equation $pH - pK_b = 1$ will be applicable to an acidic buffer when :-
(1) [Acid] = [Conjugate base] (2) [Acid] ×10 = [Conjugate base]
(3) [Acid] = [Conjugate base] × 10 (4) None of these

163. 0.05 M ammonium hydroxide solution is dissolved in 0.001 M ammonium chloride solution , What will be the OH^- ion concentration of this solution : K_b (NH_4OH) = 1.8×10^{-5} :-
(1) 3.0×10^{-3} (2) 9.0×10^{-4} (3) 9.0×10^{-3} (4) 3.0×10^{-4}

164. When 0.02 moles of NaOH are added to a litre of buffer solution, its pH changes from 5.75 to 5.80. What is its buffer capacity :-
(1) 0.4 (2) 0.05 (3) –0.05 (4) 2.5

165. Calculate the pH of a buffer prepared by mixing 300 cc of 0.3 M NH_3 and 500 cc of 0.5 M NH_4Cl. K_b for $NH_3 = 1.8\times10^{-5}$:-
(1) 8.1187 (2) 9.8117 (3) 8.8117 (4) None of these

166. What amount of sodium propanoate should be added ot one litre of an aqueous solution containing 0.02 mole of propanoic acid (Ka = 1.34×10^{-5} at 25°C) to obtain a buffer solution of pH 4.75 :-
(1) 4.52×10^{-2} M (2) 3.52×10^{-2} M (3) 2.52×10^{-2} M (4) 1.52×10^{-2} M

167. What will be the pH of the solution, if 0.01 moles of HCl is dissolved in a buffer solution containing 0.02 moles of propanoic acid ($K_a = 1.34\times10^{-5}$) and 0.0152 moles of salt, at 25°C : [log (0.173) = –0.76]
(1) 3.11 (2) 4.11 (3) 5.11 (4) 6.11

168. Calculate the pH of a buffer solution prepared by dissolving 30 g of Na_2CO_3 in 500 mL of an aqueous solution containing 150 mL of 1 M HCl.

Ka for HCO_3^- $= 5.63\times10^{-11}\left[\log\left(\frac{133}{150}\right) = -0.05\right]$

(1) 8.197 (2) 9.197 (3) 10.197 (4) 11.197

169. Calculate the ratio of pH of a solution containing 1 mole of CH_3COONa + 1 mole of HCl per liter and of other solution containing 1 mole CH_3COONa + 1 mole of acetic acid per litre :-

(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) 2 : 3

170. When 20 mL of $\frac{M}{20}$ NaOH are added to 10 mL of $\frac{M}{10}$ HCl, the resulting solution will :-

(1) Turn blue litmus red
(2) Turn phenolphthalein solution
(3) Turn methyl orange red
(4) Will have no effect on either red or blue litmus

171. 10 mL of a solution contains 0.1 M NH_4Cl + 0.01 M NH_4OH. Which addition would not change the pH of solution :-

(1) Adding 1 mL water
(2) adding 5 mL of 0.1 M NH_4Cl
(3) Adding 5 mL of 0.1 M NH_4OH
(4) Adding 10 mL of 0.1 M NH_4Cl

172. $\frac{N}{10}$ acetic acid was titrated with $\frac{N}{10}$ NaOH. When 25%, 50% and 75% of titration is over then the pH of the solution will be :-[$K_a = 10^{-5}$]

(1) 5 + log1/3, 5 + log3
(2) 5 + log3, 4, 5 + log1/3
(3) 5 – log1/3, 5, 5 – log3
(4) 5 – log1/3, 4, 5 + log1/3

ACID AND BASE

173. The conjugated acid of O^{-2} ion's is :-

(1) O_2^+ (2) H^+ (3) H_3O^+ (4) OH^-

174. Ionization constant of AOH and BOH base K_{b_1} and K_{b_2} .Their relation $pK_{b_1} < pK_{b_2}$. Conjugate of following base, does not show maximum pH :

(1) AOH (2) BOH (3) Both of them (4) NOT

175. Select the species which can function as –Lewis base, bronsted acid and bronsted base:-

(a) H_2O (b) NH_4^+ (c) N^{-3}

Correct code is :-

(1) Only a (2) a, b (3) a, c (4) b, c

176. Which ion does not show acid behavior :-

(1) $\left[Al(H_2O)_6\right]^{+3}$ (2) $\left[Fe(H_2O)_6\right]^{+3}$ (3) HPO_4^{-2} (4) ClO_3^-

177. An example of Lewis acid is :-

(1) CaO (2) CH_3NH_2 (3) SO_3 (4) None of these

178. In the reaction $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ water behaves as :-

(1) Acid (2) Base (3) Neutral (4) Both acid & Base

179. Which acts as Lewis base in the reaction $BCl_3 + :PH_3 \rightarrow Cl_3B \leftarrow PH_3$

(1) PH_3 (2) BCl_3 (3) Both 1 & 2 (4) None

180. Which acts as Lewis acid in the reaction $SnCl_2 + 2Cl^- \longrightarrow [SnCl_4]^{-2}$

(1) Cl^- (2) $SnCl_2$ (3) $SnCl_4$ (4) None

181. The conjugated base of $(CH_3)_2\overset{+}{N}H_2$ is :-

(1) CH_3NH_2 (2) $(CH_3)_2N^+$ (3) $(CH_3)_2N$ (4) $(CH_3)_2NH$

182. Which equilibrium can be described as Lewis acid base reaction but not Bronsted acid base reaction :-

(1) $H_2O + CH_3COOH \rightleftharpoons H_3O^+ + CH_3COO^-$

(2) $2NH_3 + H_2SO_4 \rightleftharpoons 2NH_4^+ + SO_4^{2-}$

(3) $NH_3 + CH_3COOH \rightleftharpoons NH_4^+ + CH_3COO^-$

(4) $Cu^{+2} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$

183. Conjugate base of hydrazoic acid is :-

(1) HN_3^- (2) N_3^- (3) N^{3-} (4) N_2^-

184. NH_3 gas dissolves in water to give NH_4OH, in this reaction, water acts as :-

(1) An acid (2) A base (3) A salt (4) A conjugate base

185. Conjugate acid of $Zn(OH)_2$ is :-

(1) $Zn(OH)^+$ (2) $Zn(OH_3)^-$ (3) Zn^{2+} (4) None

186. When ammonia is added to water it decreases the concentration of which of the following ion

(1) OH^- (2) H_3O^+ (3) NH_4^+ (4) None

187. The strongest acid among the following is :-

(1) $ClO_3(OH)$ (2) $ClO_2(OH)$ (3) $SO(OH)_2$ (4) $SO_2(OH)_2$

188. Which of the following is not a Bronsted acid :-

(1) $CH_3NH_4^+$ (2) CH_3COO^- (3) H_2O (4) HSO_4^-

189. Which of the following example behave as a Lewis acid BF_3, $SnCl_2$, $SnCl_4$:-

(1) Stanus, chloride, stanic chloride (2) BF_3, Stanus chloride

(3) Only BF_3 (4) BF_3, stanus chloride, stanic chloride

190. In the reaction

$HNO_3 + H_2O \rightleftharpoons H_3O^+ + NO_3^-$ is

(1) H_2O (2) H_3O^- (3) NO_3^- (4) H_3O^+ and NO_3^-

191. The conjugate base of the weak acid in the reaction $HBr + H_2O \rightleftharpoons H_3O^+ + Br^-$ is

(1) HBr (2) H_2O (3) Br^- (4) H_3O^-

192. In the reaction, $AlCl_3 + Cl^- \rightarrow [AlCl_4]^-$, $AlCl_3$ acts as :-

(1) Salt (2) Lewis base (3) Bronsted acid (4) Lewis acid

193. Mg^{2+} is ----- than Al^{3+} :-

(1) Strong Lewis acid (2) Strong Lewis base
(3) Weak Lewis acid (4) Weak Lewis base

194. The two Bronsted bases in the reaction $HC_2O_4^- + PO_4^{3-} \rightleftharpoons HPO_4^{2-} + C_2O_4^{2-}$ are

(1) $HC_2O_4^-$ and PO_4^{2-} (2) HPO_4^{2-} and $C_2O_4^{2-}$
(3) PO_4^{3-} and $C_2O_4^{2-}$ (4) $HC_2O_4^-$ and HPO_4^{2-}

195. The compound HCl behaves as --- in the reaction, $HCl + HF \rightleftharpoons H_2^+Cl + F^-$

(1) Strong acid (2) Strong base (3) Weak acid (4) Weak base

196. Which of the following is not a lewis base :-

(1) NH_3 (2) O^{2-} (3) H_2O (4) I^+

197. Which of the following is bronsted Lowry acid :-

(1) SO_4^{2-} (2) H_3O^+ (3) OH^- (4) Cl^-

198. The conjugated base for bicarbonate ion is :-

(1) CO_3^{2-} (2) HCO_3^- (3) CO_2 (4) H_2CO_3

199. Conjugated base of OH^- is :-

(1) H_2O (2) H_3O^+ (3) H^+ (4) O^{2-}

200. HCl does not behave as acid in :-

(1) NH_3 (2) C_2H_5OH (3) H_2O (4) C_6H_6

201. Which of the following is a base according to Lowry – Bronsted concept -

(1) I^- (2) H_3O^+ (3) HCl (4) NH_4^+

202. In which of the following reactions NH_3 acts as acid

(1) $NH_3 + HCl \rightarrow NH_4Cl$ (2) $NH_3 + H^+ \rightarrow NH_4^+$

(3) $NH_3 + Na \rightarrow NaNH_2 + \frac{1}{2}H_2$ (4) NH_3 cannot act as acid

203. According to Bronsted concept, the acids in the following reaction

$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

(1) NH_3 and NH_4^+ (2) H_2O and OH^-

(3) H_2O and NH_4^+ (4) NH_3 and OH^-

204. Consider the following reactions :-

(i) $CO_3^{2-} + H_2O \rightleftharpoons HCO_3^- + OH^-$

(ii) $CO_2 + H_2O \rightleftharpoons H_2CO_3$

(iii) $NH_3 + H_2O \rightleftharpoons NH_4OH$

(iv) $HCl + H_2O \rightleftharpoons Cl^- + H_3O^-$

Which of the pairs of reactions proves that water is amphoteric in character :-

(1) (i) and (ii) (2) (ii) and (iii) (3) (iii) and (iv) (4) (i) and (iii)

205. CH_3COO^- ion is a :-

(1) Weak conjugate base (2) Strong conjugate base

(3) Weak conjugate acid (4) Strong conjugate acid

206. Which of the following is strongest conjugate base

(1) ClO_4^- (2) HCO_3^- (3) F^- (4) HSO_4^-

207. Which of the following species can act as Lewis base :-

(1) $AlCl_3$ (2) Cu^{2+} (3) NH_3 (4) BF_3

208. A compound having the formula NH_2CH_2COOH may behave :-

(1) Only as an acid (2) Only as an base

(3) Both as an acid and base (4) Neither acid nor base

209. BF_3 is acid according to :-

(1) Lewis (2) Arrhenius

(3) Bronsted and Lowery (4) Madam Curie

210. Which of the following can act both as Bronsted acid and Bronsted base :-

(1) Na_2CO_3 (2) O^{2-} (3) CO_3^{-2} (4) NH_3

211. The strongest conjugate base is :-

(1) NO_3^- (2) Cl^- (3) SO_4^{2-} (4) CH_3COO^-

212. Aluminum chloride is :-

(1) Bronsted Lowry acid (2) Arrhenius acid

(3) Lewis acid (4) Lewis base

213. Water is a :-
(1) Protogenic solvent (2) Protophilic solvent
(3) Amphiprotic solvent (4) Aprotic solvent

214. Ammonium ion is :-
(1) A conjugate acid (2) A conjugate base
(3) Neither an acid nor a basic (4) Both an acid and a base

215. Species which do not act both as Bronsted acid and base is :-
(1) $(HSO_4)^{-1}$ (2) Na_2CO_3 (3) NH_3 (4) OH^{-1}

216. Which on e of the following is strong Lewis base & Bronsted acid & Bronsted base:-
(1) NH_3 (2) PH_3 (3) CH_4 (4) BH_3

217. Which of the following pair is Lewis acid & Lewis base & Product of these is also Lewis base
(1) BF_3m NH_3 (2) $SiCl_4$, $2Cl^-$ (3) $CH_3^{\oplus}$ (4) None of these

218. Which of the following is not a correct statement
(1) Arrhenius theory of acids-bases is capable of explaining he acidic or basic nature of the substance in the solvents other than water
(2) Arrhenius theory does not explain acidic nature of $AlCl_3$
(3) The aqueous solution of Na_2CO_3 is alkaline although it does not contain OH^- ions
(4) Aqueous solution of CO_2 is acidic although it does not contain H^+ ions

219. For the reaction $NH_4^+ + S^{-2} \rightleftharpoons NH_3 + HS^-$, NH_3 and S^{-2} are a group of :-
(1) Acids (2) Bases (3) Acid-base pair (4) None of these

220. According to Lewis concept acid & base pair is -
(1) HO^-, H^+ (2) Ag^+, Cl^- (3) BF_3, NH_3 (4) None of these

ANSWER KEY

EXERCISE-I (Conceptual Questions)

1.	(2)	**2.**	(2)	**3.**	(2)	**4.**	(2)	**5.**	(4)	**6.**	(4)	**7.**	(2)
8.	(1)	**9.**	(3)	**10.**	(1)	**11.**	(1)	**12.**	(4)	**13.**	(3)	**14.**	(1)
15.	(1)	**16.**	(2)	**17.**	(4)	**18.**	(1)	**19.**	(2)	**20.**	(3)	**21.**	(4)
22.	(4)	**23.**	(3)	**24.**	(4)	**25.**	(1)	**26.**	(1)	**27.**	(1)	**28.**	(3)
29.	(4)	**30.**	(1)	**31.**	(3)	**32.**	(3)	**33.**	(4)	**34.**	(1)	**35.**	(2)
36.	(4)	**37.**	(4)	**38.**	(3)	**39.**	(2)	**40.**	(1)	**41.**	(1)	**42.**	(4)
43.	(1)	**44.**	(2)	**45.**	(3)	**46.**	(3)	**47.**	(3)	**48.**	(3)	**49.**	(3)
50.	(2)	**51.**	(3)	**52.**	(3)	**53.**	(4)	**54.**	(4)	**55.**	(4)	**56.**	(2)
57.	(4)	**58.**	(4)	**59.**	(3)	**60.**	(2)	**61.**	(4)	**62.**	(3)	**63.**	(1)
64.	(3)	**65.**	(3)	**66.**	(3)	**67.**	(4)	**68.**	(3)	**69.**	(4)	**70.**	(1)
71.	(4)	**72.**	(2)	**73.**	(2)	**74.**	(1)	**75.**	(3)	**76.**	(4)	**77.**	(4)

78.	(2)	**79.**	(2)	**80.**	(4)	**81.**	(2)	**82.**	(4)	**83.**	(2)	**84.**	(3)
85.	(3)	**86.**	(2)	**87.**	(1)	**88.**	(1)	**89.**	(2)	**90.**	(2)	**91.**	(2)
92.	(4)	**93.**	(3)	**94.**	(2)	**95.**	(3)	**96.**	(4)	**97.**	(4)	**98.**	(1)
99.	(2)	**100.**	(1)	**101.**	(2)	**102.**	(4)	**103.**	(3)	**104.**	(3)	**105.**	(1)
106.	(4)	**107.**	(3)	**108.**	(2)	**109.**	(2)	**110.**	(3)	**111.**	(4)	**112.**	(3)
113.	(1)	**114.**	(4)	**115.**	(4)	**116.**	(2)	**117.**	(2)	**118.**	(4)	**119.**	(2)
120.	(1)	**121.**	(3)	**122.**	(2)	**123.**	(1)	**124.**	(2)	**125.**	(2)	**126.**	(3)
127.	(2)	**128.**	(3)	**129.**	(2)	**130.**	(3)	**131.**	(1)	**132.**	(4)	**133.**	(4)
134.	(2)	**135.**	(3)	**136.**	(4)	**137.**	(1)	**138.**	(4)	**139.**	(3)	**140.**	(3)
141.	(3)	**142.**	(3)	**143.**	(3)	**144.**	(1)	**145.**	(1)	**146.**	(1)	**147.**	(3)
148.	(4)	**149.**	(3)	**150.**	(1)	**151.**	(1)	**152.**	(1)	**153.**	(2)	**154.**	(2)
155.	(4)	**156.**	(3)	**157.**	(1)	**158.**	(1)	**159.**	(1)	**160.**	(1)	**161.**	(1)
162.	(2)	**163.**	(2)	**164.**	(1)	**165.**	(3)	**166.**	(4)	**167.**	(2)	**168.**	(3)
169.	(3)	**170.**	(4)	**171.**	(1)	**172.**	(1)	**173.**	(4)	**174.**	(2)	**175.**	(1)
176.	(4)	**177.**	(3)	**178.**	(1)	**179.**	(1)	**180.**	(2)	**181.**	(4)	**182.**	(4)
183.	(2)	**184.**	(1)	**185.**	(1)	**186.**	(2)	**187.**	(1)	**188.**	(2)	**189.**	(4)
190.	(3)	**191.**	(2)	**192.**	(4)	**193.**	(3)	**194.**	(3)	**195.**	(4)	**196.**	(4)
197.	(2)	**198.**	(1)	**199.**	(4)	**200.**	(4)	**201.**	(1)	**202.**	(3)	**203.**	(3)
204.	(3)	**205.**	(2)	**206.**	(2)	**207.**	(3)	**208.**	(3)	**209.**	(1)	**210.**	(4)
211.	(4)	**212.**	(3)	**213.**	(3)	**214.**	(1)	**215.**	(2)	**216.**	(1)	**217.**	(3)
218.	(1)	**219.**	(2)	**220.**	(3)								