PROBLEM SOLVING TECHNIQUES OF PHYSICAL CHEMISTRY FOR NEET

BY

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BASIC EXERCISE

1. INTRODUCTION

1. The formula weight of H_2SO_4 is 98. The weight of the acid in 400mL of 0.1 M solution is:-

(1) 2.45 g (2) 3.92 g (3) 4.90 g (4) 9.8 g

Ans. **(2)**

2. Normality of 2M sulphuric acid is:-

(1) 2 N (2) 4N (3) N/2 (4) N/4

Ans. **(2)**

3. Basicity of H_3PO_3 and H_3PO_2 are respectivily :-

(1) 1 and 2 (2) 2 and 3 (3) 3 and 2 (4) 2 and 1

Ans. **(4)**

4. Find out pH of solution having 2×10^{-3} moles of OH^- ion's in 2 litre solution :-

(1) pH = 3 (2) pH = 3 + log2 (3) pH = 3 – log2 (4) pH = 11

Ans. **(4)**

5. 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}

Ans. **(1)**

6. 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}

Ans. **(2)**

2. OSTWALD'S DILUTION LAW

7. If α 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) $\frac{\alpha(y)^{-1}}{2}$ (2) $y(\alpha)^{-1}$ (3) $\frac{y(\alpha)^{-1}}{2}$ (4) None of them

Ans. **(3)**

8. 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

Ans. **(1)**

9. Ostwald's dilution law is not applicable for strong electrolytes because:-

(1) Strong electrolytes are completely ionised (2) Strong electrolytes are volatile

(3) Strong electrolytes are unstable (4) Strong electrolytes often contain metal ions

Ans. **(1)**

10. The degree of ionisation of a compound depends upon :

(1) Size of the solute molecules (2) Nature of the solute molecules

(3) Nature of the container taken (4) The amount of current passed

Ans. **(2)**

11. Which of the following will occur if a 1.0 M solution of a weak acid is diluted to 0.01 M at constant temperature:-

(1) Percentage ionisation will increase (2) $[H^+]$ will decrease to 0.01M

(3) K_a will increase (4) pH will decrease by 2 units

Ans. **(1)**

12. The pH of 0.15 M solution of HOCl ($K_a = 9.6 \times 10^{-6}$) is:-

(1) 4.42 (2) 2.92 (3) 3.42 (4) None

Ans. **(2)**

13. The extent of ionisation increases (weak electrolytes)

(1) With the increase in concentration of solute

(2) On decreasing the temp. of solution

(3) On addition of excess of water to the solution

(4) On stirring the solution vigorously

Ans. **(3)**

14. If Ka 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

Ans. **(4)**

15. The molarity of nitrous acid at which its pH becomes 2.($K_a = 4.5 \times 10^{-4}$) :-

(1) 0.3333 (2) 0.4444 (3) 0.6666 (4) 0.2222

Ans. **(4)**

16. Correct statement for HCN weak acid at 25^0C temperature.:-

(1) $\alpha = \frac{K_a}{[H^+]}$ (2) $\alpha = \frac{K_a \times [OH^-]}{K_w}$ (3) (1) & (2) both (4) $K_b = C\alpha^2$

Ans. **(3)**

3. EXPLANATION OF WATER

17. Ionic product of water will increase, if :-

(1) Dissociation the pressure (2) Add H^+

(3) Add OH^- (4) Increase the temperature

Ans. **(4)**

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

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

Ans. **(1)**

19. At 25^0C, the dissociation constant for pure water is given by :-

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

Ans. **(1)**

20. At 90^0C, pure water has $[H_3O^+] = 10^{-6.7}$ mol L^{-1} what is the value of K_W at 90^0C:-

(1) 10^{-6} (2) 10^{-12} (3) 10^{-67} (4) $10^{-13.4}$

Ans. **(4)**

21. The common ion effect is shown by which of the following sets of solutions :-

(1) $BaCl_2 + BaNO_3$ (2) NaCl + HCl (3) $NH_4OH + NH_4Cl$ (4) None

Ans. **(3)**

22. Which of the following is a true statement :

(1) The ionisation 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 298K, the number of H^+ ions in a litre of water is 6.023×10^{16}.

Ans. **(4)**

23. If it is known that H_2S is a weak acid and it is ionised 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

Ans. **(1)**

4. SALTS, TYPES OF SALT & CONJUGATE THEORY

24. Which is a basic salt :–

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

Ans. **(4)**

25. The process of neutralisation invariably results in the production of :-

(1) H^+ ions (2) OH^- ions

(3) Both H^+ and OH^- ions (4) Molecules of water

Ans. **(4)**

26. Which of the following is an acid salt :-

(1) Na_2S (2) Na_2SO_3 (3) $NaHSO_3$ (4) Na_2SO_4

Ans. **(3)**

27. 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

Ans. **(2)**

5. HYDROLYSIS OF SALTS

28. What will the pH of 1.0 M ammonium formate solution, If $K_a = 1 \times 10^{-4}$ acid $K_b = 1 \times 10^{-5}$:-

(1) 6.5 (2) 7.5 (3) 8.0 (4) 9.0

Ans. **(1)**

29. $HCOO^- + H_2O \rightleftharpoons HCOOH + OH^-$ is related:-

(1) $h = \sqrt{K_h}$ (2) $h = \sqrt{\frac{K_h}{C}}$ (3) $h = \sqrt{\frac{K_h}{V}}$ (4) $K_h = \sqrt{hc}$

Ans. **(2)**

30. If pK_b for CN^- at 25°C is 4.7. The pH of 0.5M aqueous NaCN solution is :-

(1) 12 (2) 10 (3) 11.5 (4) 11

Ans. **(3)**

31. 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

Ans. **(3)**

32. A weak acid react with strong base, ionisation 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}

Ans. **(2)**

33. 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) $[OH^-] = C. K_a. K_w.$

Ans. **(3)**

34. 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

Which is/are not correctly matched:-

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

Ans. **(3)**

35. 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)

Ans. **(4)**

36. 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

Ans. **(4)**

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

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

Ans. **(4)**

38. 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}

Ans. **(2)**

6. SOLUBILITY & SOLUBILITY PRODUCT(K_{sp})

39. 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

Ans. **(4)**

40. 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) $[Hg^{2+}]^2 \times [I^{-}]^2$

Ans. **(3)**

41. Concentration of Ag^{+} ions in saturated solution of Ag_2CrO_4 at 20^0C is 1.5×10^{-4} mol L^{-1}. At 20^0C, the solubility product of Ag_2CrO_4 is :-

(1) 3.3750×10^{-12} (2) 1.6875×10^{-10} (3) 1.68×10^{-12} (4) 1.6875×10^{-11}

Ans. **(3)**

42. 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

Ans. **(1)**

43. 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}

Ans. **(3)**

44. 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}

Ans. **(3)**

45. 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) $K_{sp}(M_2X) > K_{sp}(QY_2) > K_{sp}(PZ_3)$

Ans. **(3)**

46. If the solubility of $PbBr_2$ is 'S' g molecules per litre, considering 100% ionisation its solubility product is :-

(1) $2S^3$ (2) $4S^2$ (3) $4S^3$ (4) $2S^4$

Ans. **(3)**

47. 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) $18S^3$ (4) $2916\ S^8$

Ans. **(4)**

48. One litre of saturated solution of $CaCO_3$ is evaporated to dryness, when 7.0 g of 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}

Ans. **(1)**

7. APPLICATION OF SOLUBILITY PRODUCT(K_{sp})

49. Correct order of solubility porduct is :-

(1) $CaCrO_4 > SrCrO_4 > BaCrO_4$ (2) $BaCrO_4 > SrCrO_4 > CaCrO_4$

(3) $CaCrO_4 > BaCrO_4 > SrCrO_4$ (4) $SrCrO_4 > BaCrO_4 > CaCrO_4$

Ans. **(1)**

50. 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) $s = \frac{1}{2}S$

Ans. **(3)**

51. 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} M (4) 4×10^{-4} M

Ans. **(4)**

52. M_2SO_4 (M^+ is a 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

Ans. **(2)**

53. 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 (7.0×10^{-26}) (4) AgCl (1.7×10^{-10})

Ans. **(2)**

54. 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 solublity is:-

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

Ans. **(4)**

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

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

Ans. **(2)**

56. 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

Ans. **(3)**

57. If the solubility product of $AgBrO_3$ 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) $sAgBrO_3 = sAgSO_4$

Ans. **(3)**

58. 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}

Ans. **(2)**

59. 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

Ans. **(2)**

60. Consider (1) $Zn(OH)_2$ (2) $Cr(OH)_3$ (3) $Mg(OH)_2$ (4) $Al(OH)_3$ which hydroxide is precipitated by NH_4OH containing NH_4Cl :-

(1) 1, 2 (2) 2, 4 (3) Only 4 (4) 1, 2, 3 and 4

Ans. **(2)**

61. What will happen if the pH of the solution of 0.001 M $Mg(NO_3)_2$ solution is adjusted to pH = 9
($K_{sp}Mg(OH)_2 = 8.9 \times 10^{-12}$)
(1) ppt will take place (2) ppt will not take place
(3) Solution will be saturated (4) None of these

Ans. **(2)**

62. 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

Ans. **(4)**

63. 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

Ans. **(3)**

64. 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

Ans. **(2)**

65. 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

Ans. **(3)**

66. 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 cation analysis (4) Both II - A and II-B gps.

Ans. **(4)**

67. 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) $Zn(OH)_2$, $Mg(OH)_2$, $Fe(OH)_3$

Ans. **(1)**

8. pH

68. 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

Ans. **(3)**

69. 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}

Ans. **(1)**

70. A metal hydroxide of molecular formula $M(OH)_4$ is 50% ionised. Its 0.0025M solution will have the pH :-

(1) 12 (2) 2 (3) 4 (4) 11.7

Ans. **(4)**

71. In the following solutions, the conc. of different acids are given, 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) $\frac{M}{20}H_2SO_4$, $\frac{M}{5}HNO_3$, $\frac{M}{5}HClO_4$

Ans. **(3)**

72. The pH of the solution containing 10 mL of a 0.1M NaOH and 10 mL of 0.05M H_2SO_4 would be

(1) Zero (2) 1 (3) >7 (4) 7

Ans. **(4)**

73. 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 increases 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

Ans. **(4)**

74. 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.

Ans. **(2)**

75. 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

Ans. **(3)**

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

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

Ans. **(2)**

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

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

Ans. **(1)**

78. 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

Ans. **(2)**

79. 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

Ans. **(2)**

80. How many moles of HCl must be removed from 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

Ans. **(3)**

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

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

Ans. **(2)**

82. 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 : - [$K_w = 1 \times 10^{-14}$]

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

Ans. **(1)**

83. 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

Ans. **(4)**

84. 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

Ans. **(3)**

9. Buffer Solutions and Indicator

85. To a 50 mL of 0.05M formic acid how much volume of 0.10M sodium formate 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) 39.6 mL (4) 100 mL

Ans. **(3)**

86. 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

Ans. **(4)**

87. 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

Ans. **(4)**

88. What is the suitable indicator for titration of NaOH and oxalic acid:-

(1) Methyl orange (2) Methyl red (3) Phenolphthalein (4) Starch solution

Ans. **(3)**

89. 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

Ans. **(3)**

90. 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

Ans. **(3)**

91. Ka for HCN is 5×10^{-10} at 25^0C. For maintaining a constant pH of 9, the volume of 5M KCN solution required to be added to 10mL of 2M HCN solution is-

(1) 4 mL (2) 7.95 mL (3) 2 mL (4) 9.3 mL

Ans. **(3)**

92. 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

Ans. **(3)**

93. 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

Ans. **(3)**

94. For weak acid strong base titration, the indicator used is :-

(1) Potassium di-chromate (2) Methyl orange

(3) Litmus (4) Phenolphthalein

Ans. **(4)**

95. 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) $CH_3COOH + NH_4OH$

Ans. **(3)**

96. 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

Ans. **(1)**

97. 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}

Ans. **(1)**

98. A certain acidic buffer solution contains equal 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

Ans. **(1)**

99. Which of the following solutions does not act as buffer :–

(1) $H_3PO_4 + NaH_2PO_4$ (2) $NaHCO_3 + H_2CO_3$ (3) $NH_4Cl + HCl$ (4) $CH_3COOH + CH_3COONa$

Ans. **(3)**

100. 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

Ans. **(1)**

101. On addition of NaOH to CH_3COOH solution, 60% of the acid is neutralised. 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

Ans. **(1)**

102. 500 mL of 0.2 M acetic acid are added to 500 mL of 0.30 M sodium acetate solution. If the dissociation constant of acetic acid is 1.5×10^{-5} then pH of the resulting solution is :-

(1) 5.0 (2) 9.0 (3) 3.0 (4) 4.0

Ans. **(1)**

103. Half of the formic acid solution is neutralised 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

Ans. **(1)**

104. A solution contains 0.2M NH_4OH and 0.2M NH_4Cl. If 1.0 mL of 0.001 M HCl is added to it. What will be the $[OH^-]$ of the resulting solution

$[K_b = 2 \times 10^{-5}]$:-

(1) 2×10^{-5} (2) 5×10^{-10} (3) 2×10^{-3} (4) None of these

Ans. **(1)**

105. 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

Ans. **(1)**

106. $\frac{N}{10}$ 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 + log 1/3, 5, 5 + log 3 (2) 5 + log 3, 4, 5 + log 1/3

(3) 5 – log 1/3, 5, 5 – log 3 (4) 5 – log 1/3, 4, 5 + log 1/3

Ans. **(1)**

10. Acid, Base

107. Which ion does not show acid behaviour :-

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

Ans. **(4)**

108. An example of Lewis acid is:-

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

Ans. **(3)**

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

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

Ans. **(1)**

110. 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

Ans. **(1)**

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

Ans. **(4)**

112. 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
Ans. **(2)**

113. In the reaction
$HNO_3 + H_2O \rightleftharpoons H_3O^+ + NO_3^-$, the conjugate base of HNO_3 is :-
(1) H_2O (2) H_3O^+ (3) NO_3^- (4) H_3O^+ and NO_3^-
Ans. **(3)**

114. 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
Ans. **(3)**

115. 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)
Ans. **(3)**

116. Which one of the following is strong Lewis base & Bronsted acid & bronsted base:-
(1) NH_3 (2) PH_3 (3) CH_4 (4) BH_3
Ans. **(1)**

117. Which of the following is not a correct statement
(1) Arrhenius theory of acids-bases is capable of explaining the acidic or basic nature of the substances 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
Ans. **(1)**

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

EXERCISE - 2

ANALYTICAL EXERCISE

1. The number of hydrogen ions in 10 ml of a solution with pH = 13 is

(1) 10^{13} (2) 6.023×10^{8} (3) 6.023×10^{10} (4) 6.023×10^{13}

Ans. **(2)**

2. In the following reaction

$HC_2O_4^- + PO_4^{3-} \rightleftharpoons HPO_4^{2-} + C_2O_4^{2-}$

which pair can act as Bronsted bases only ?

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

Ans. **(4)**

3. At 30°C, the solubility of Ag_2CO_3 ($K_{sp} = 8 \times 10^{-12}$) would be maximum in 1 litre of

(1) 0.05 M Na_2CO_3 (2) 0.05 M $AgNO_3$ (3) Pure water (4) 0.05 M NH_3

Ans. **(4)**

4. Which of the following solutions will have pH close to 1 ?

(1) 100 ml, $\frac{M}{5}$ HCl + 100 ml, $\frac{M}{5}$ NaOH (2) 55 ml, $\frac{M}{10}$ HCl + 45 ml, $\frac{M}{10}$ NaOH

(3) 10 ml, $\frac{M}{10}$ HCl + 90 ml, $\frac{M}{10}$ NaOH (4) 75 ml, $\frac{M}{5}$ HCl + 25 ml, $\frac{M}{5}$ NaOH

Ans. **(4)**

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

(1) Br^-, Cl^-, I^- (2) I^-, Cl^-, Br^- (3) I^-, Br^-, Cl^- (4) Cl^-, Br^-, I^-

Ans. **(3)**

6. If ionic product of water is $K_w = 10^{-16}$ at 4°C, then a solution with pH = 7.5 at 4°C will

(1) Turn blue litmus red (2) Turn red litmus blue (3) Be neutral to litmus (4) Be alkaline

Ans. **(1)**

7. When a small amount of HCl is added to a buffer solution of acetic acid and sodium acetate

(1) pH increase (2) $[H^+]$ decreases

(3) Dissociation of acetic acid decreases (4) $[CH_3COO^-]$ increases

Ans. **(3)**

8. When equal volumes of pH = 4 and pH = 6 are mixed together then the pH of the resulting solution will be [log 5 = 0.7]

(1) 4.3 (2) 4.7 (3) 5 (4) 5.3

Ans. **(1)**

9. The solubility product of AgBr is 4.9×10^{-9}. The solubility of AgBr will be

(1) 7×10^{-4} mole/litre (2) 7×10^{-5} g/litre (3) 1.316×10^{-2} g/litre (4) 1×10^{-3} mole/litre

Ans. **(3)**

10. In which of the following solution, AgCl has minimum solubility ?

(1) 0.05 M $AgNO_3$ (2) 0.01 M $CaCl_2$ (3) 0.01 M NaCl (4) 0.01 M NH_4OH

Ans. **(1)**

11. The pH of $\frac{M}{100}$ $Ca(OH)_2$ is

(1) 1.699 (2) 12 (3) 12.301 (4) 12.699

Ans. **(3)**

12. The pH of a mixture of 100 ml 1 M H_2SO_4 and 200 ml 1 N NaOH at 25°C is

(1) More than 7 (2) Less than 7 (3) Equal to 7 (4) Can't predict

Ans. **(3)**

13. The solubility product of $BaSO_4$ is 4×10^{-10}. The solubility of $BaSO_4$ in presence of 0.02 N H_2SO_4 will be

(1) 4×10^{-8} M (2) 2×10^{-8} M (3) 2×10^{-5} M (4) 2×10^{-4} M

Ans. **(1)**

14. Solubility product of the salt, A_xB_y will be represented most suitably, if the solubility is represented by S

(1) $K_{sp} = x^y y^x (S)^{x \times y}$ (2) $K_{sp} = x^y + y^x + (S)^{x+y}$

(3) $K_{sp} = x^x y^y (S)^{x+y}$ (4) $K_{sp} = x \cdot S^{x+y} \cdot y$

Ans. **(3)**

15. Which is incorrect ?

(1) Conjugate acid of H_2O is H_3O^+ (2) Conjugate base of HCO_3^- is CO_3^{2-}

(3) Conjugate base of NH_3 is NH_2^- (4) Conjugate base of HOCl is Cl^-

Ans. **(4)**

16. A buffer solution can be obtained from

(1) HCN and KCN (2) CH_3COONH_4 (3) NH_4Cl and NH_4OH (4) All of these

Ans. **(4)**

17. The solubility of $BaSO_4$ in water, is 2.33×10^{-3} gL^{-1}. Its solubility product will be (molecular weight of $BaSO_4 = 233$) :-

(1) 1×10^{-5} (2) 1×10^{-10} (3) 1×10^{-15} (4) 1×10^{-20}

Ans. **(2)**

18. The solubility product of $BaSO_4$ at 25°C is 1.0×10^{-9}. What would be the concentration of H_2SO_4 necessary to precipitate $BaSO_4$ from a solution of 0.01 M Ba^{+2} ions :-

(1) 10^{-9} (2) 10^{-8} (3) 10^{-7} (4) 10^{-6}

Ans. **(4)**

19. pH of the solution of $HCOONH_4$ is 6.48 this can be explained by :-

(1) Hydrolysis of both cation and anion (2) Hydrolysis of cation

(3) Hydrolysis of anion (4) Hydrolysis of water

Ans. **(1)**

20. A solution of $FeCl_3$ in water acts as acidic due to:-

(1) Acidic impurities (2) Ionisation (3) Hydrolysis of Fe^{3+} (4) Dissociation

Ans. **(3)**

21. The pKa of HNO_2 is 3.37. The pH of HNO_2 in its 0.01 mol L^{-1} aqueous solution will be :-

(1) 5.37 (2) 2.69 (3) 1.69 (4) 0.69

Ans. **(2)**

22. When add 0.01 M HCl in aqueous solution of acetic acid

(1) CH_3COO^- molar conc. is decrease (2) CH_3COOH molar conc. is decrease

(3) CH_3COO^- molar conc. is increase (4) None

Ans. **(1)**

23. On passing H_2S gas through a solution of Cu^{+2} and Zn^{+2} ions, CuS is precipitated first because:-

(1) Solubility product of CuS is equal to the ionic product of ZnS ;

(2) Solubility product of CuS is equal to the solubility product of ZnS.

(3) Solubility product of CuS is lower than the solubility product of ZnS.

(4) Solubility product of CuS is greater than the solubility product of ZnS.

Ans. **(3)**

24. Solubility of MX_2 – type electrolytes is 0.5×10^{-4} mol L^{-1} then find out K_{sp} of electrolytes:-

(1) 5×10^{-12} (2) 25×10^{-10} (3) 1×10^{-13} (4) 5×10^{-13}

Ans. **(4)**

25. When H_2S gas is passed through the HCl containing aqueous solutions of $CuCl_2$, $HgCl_2$, $BiCl_3$ and $CoCl_2$, it does not precipitate out :

(1) CuS (2) HgS (3) Bi_2S_3 (4) CoS

Ans. **(4)**

26. Mark the correct statement :

(1) I group basic radicals precipitate as chloride.

(2) IV group basic radicals precipitate as sulphides

(3) V group basic radicals precipitate as carbonates

(4) All the above statements are correct

Ans. **(4)**

27. The role of NH_4Cl in group III for analysis of cations is :–

(1) that it acts as a catalyst.

(2) that it increases the solubility of hydroxides.

(3) that it lowers the OH^- concentration.

(4) that it causes the precipitation of cations as chlorides.

Ans. **(3)**

28. An acid HA has dissociated as following manner $HA \rightleftharpoons H^+ + A^-$

It has concentration 1 M and pH = 5 then find out dissociation constant :-

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

Ans. **(1)**

29. Which of the following group of cations will be precipitated when passing of H_2S gas in the presence of acidic medium:-

(1) Cu^{+2}, Cr^{+3} (2) Zn^{+2}, Co^{+2} (3) Cu^{+2}, Cd^{+2} (4) Al^{+3}, Cd^{+2}

Ans. **(3)**

30. In a saturated solution of the sparingly soluble strong electrolyte $AgIO_3$ (Moleculatr mass =283). The equilibrium which sets in is $AgIO_{3(S)} \rightleftharpoons Ag^+_{(aq)} + IO^-_{3(aq)}$ If the solubility product constant K_{sp} of $AgIO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ contained in 100 mL of its saturated solution :

(1) 2.83×10^{-3} g (2) 1.0×10^{-7} g (3) 1.0×10^{-4} g (4) 28.3×10^{-2} g

Ans. **(1)**

31. If K_{sp} of CaF_2 in pure water is 1.70×10^{-10}, then find the solubility of CaF_2 in 0.10M NaF solution :-

(1) 1.70×10^{-10} (2) 1.70×10^{-9} (3) 1.70×10^{-8} (4) 0.10 M

Ans. **(3)**

32. To precipitate Zn in form of ZnS, Why NH_4OH is first added in the solution before H_2S gas is passed through it:-

(1) To convert Zn into Zn^{+2} (2) To reduce Zinc

(3) To decrease the dissociation of H_2S (4) To increase the dissociation of H_2S

Ans. **(4)**

33. Ka for CH_3COOH is 1.8×10^{-5}. Find out the percentage dissociation of 0.2M CH_3COOH in 0.1M HCl solution

(1) 0.018 (2) 0.36 (3) 18 (4) 36

Ans. **(1)**

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

(1) 9.58 (2) 4.79 (3) 7.01 (4) 9.22

Ans. **(3)**

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

(1) $\sqrt[2]{1.6 \times 10^{-30}}$ (2) $\sqrt[4]{1.6 \times 10^{-30}}$ (3) $\sqrt[4]{1.6 \times 10^{-30}/27}$ (4) $1.6 \times 10^{-30}/27$

Ans. **(3)**

36. The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionization constant, Ka of this acid is :-
(1) 1×10^{-7} (2) 3×10^{-7} (3) 1×10^{-3} (4) 1×10^{-5}

Ans. **(4)**

37. The aqueous solution of which of the following salt will have the lowest pH
(1) NaClO (2) $NaClO_2$ (3) $NaClO_3$ (4) $NaClO_4$

Ans. **(4)**

38. Concentrations of NH_4Cl and NH_4OH in a buffer solution are in the ratio 1 : 10. If K_b for NH_4OH is 10^{-10}, then pH of the buffer is :–
(1) 4 (2) 5 (3) 9 (4) 11

Ans. **(2)**

39. When HF is dissolved in formic acid, the equilibrium established is :–

$HF + HCOOH \rightleftharpoons F^- + HCOOH_2^+$

the true pair of conjugate acid base is as a [acid, conjugate acid] [Base, conjugate base]:–
(1) (HF, HCOOH) and ($HCOOH_2^+$, F^-) (2) (HF, $HCOOH_2^+$) and (HCOOH, F^-)
(3) ($HCOOH_2^+$, HF) and (F^-, HCOOH) (4) (HF, F^-) and ($HCOOH_2^+$, HCOOH)

Ans. **(2)**

40. How many grams of dibasic acid (mol. wt. = 200) should be present in 100 mL the aqueous solution to give strength of (N/10) :–
(1) 1g. (2) 2g. (3) 5g. (4) 10g.

Ans. **(1)**

41. Which of the following is right for diprotic acid :

(1) $Ka_2 > Ka_1$ (2) $Ka_1 > Ka_2$ (3) $Ka_2 > \frac{1}{Ka_1}$ (4) $Ka_2 = Ka_1$

Ans. **(2)**

42. The first and second dissociation constants 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:-
(1) 5.0×10^{15} (2) 5.0×10^{-15} (3) 0.2×10^{5} (4) 5.0×10^{-5}

Ans. **(2)**

43. 50 mL solution of 0.1M CH_3COOH ($pK_a = 4.73$) is titrated with 0.1M NaOH solution, pH of solution when half of CH_3COOH is neutralized
(1) 4.53 (2) 4.63 (3) 4.73 (4) 4.83

Ans. **(3)**

44. What will be the concentration of $H^{\oplus}$ ions in 0.1M acetic acid and 0.1M sodium acetate solution, if the dissociation constant of acetic acid is 1.8×10^{-5} ?
(1) 1.8×10^{-7} (2) 1.8×10^{-5} (3) 1.8×10^{-2} (4) 1.8×10^{-3}

Ans. **(4)**

ASSERTION & REASON QUESTIONS

These questions consist of two statements each, printed as *Assertion* and *Reason.* While answering these Questions you are required to choose any one of the following four responses.

A. If both *Assertion* & *Reason* are True & the *Reason* is a correct explanation of the *Assertion*.

B. If both *Assertion* & *Reason* are True but *Reason* is not a correct explanation of the Assertion.

C. If *Assertion* is True but the *Reason* is False.

D. If both *Assertion* & *Reason* are False.

1. ***Assertion :–*** When small amount of acid or base is added to pure water, its pH undergoes a change.
Reason :– Addition of an acid or base increases the degree of ionisation of water.
Ans. (C)

2. ***Assertion :–*** The pH of an aqueous solution of acetic acid remains unchanged on the addition of sodium acetate.
Reason :– The ionisation of acetic acid is suppressed by the addition of sodium acetate.
Ans. (D)

3. ***Assertion :–*** If HCl gas is passed through saturated NaCl solution, solid NaCl starts to precipitate.
Reason :– HCl decreases the solubility product of NaCl.
Ans. (C)

4. ***Assertion :–*** Heat of ionisation of water is equal to the heat of neutralisation of a strong acid with a strong base.
Reason :– Water ionises to a very small extent while H^+ ions from acid combine very rapidly with OH^- from base to form H_2O.
Ans. (D)

5. ***Assertion :–*** If K_{sp} < ionic product, precipitate is formed.
Reason :– Solubility product (K_{sp}) is the highest limit of ionic product of the electrolyte in saturated solutions.
Ans. (A)

6. ***Assertion :–*** To precipitate the cations of fourth group in qualitative analysis, medium is made alkaline before passing H_2S gas.
Reason :– This is done to suppress the ionisation of H_2S.
Ans. (C)

7. ***Assertion :–*** To precipitate the cations of fourth group in qualitative analysis, medium is made alkaline before passing H_2S gas.
Reason :– This is done to suppress the ionisation of H_2S.
Ans. (C)

8. ***Assertion :–*** Addition of silver ions to a mixture of aqueous sodium chloride and sodium bromide solution will first precipitate AgBr rather than AgCl.
Reason :– Ksp of AgCl < Ksp of AgBr.
Ans. (C)

9. ***Assertion :–*** Sb(III) is not precipitated as sulphide when in its alkaline solution H_2S is passed.
Reason :– The concentration of S^{2-} ion in alkaline medium is inadequate for precipitation.
Ans. (C)

10. ***Assertion :–*** A mixture of a weak acid CH_3COOH and sodium acetate forms a buffer solution.
Reason :– A buffer solution reacts with small quantities of hydrogen or hydroxyl ions and keeps the pH almost same.
Ans. (A)

11. ***Assertion :–*** At 25°C the pH of 10^{-8} M HCl is 8.
Reason :– pH of acidic solution is always below 7 at 25°C.
Ans. (D)

12. ***Assertion :–*** In the titration of Na_2CO_3 with HCl using methyl orange indicator, the volume of the acid required at the equivalence point is twice that of the acid required using phenolphthalein as indicator.
Reason :– Two moles of HCl are required for the complete neutralisation of one mole of Na_2CO_3.
Ans. (B)

13. ***Assertion :–*** In the acid base titration involving a strong base and a weak acid methyl orange can be used as an indicator.
Reason :– Methyl orange changes its colour in pH range 3 to 5.
Ans. (D)

14. ***Assertion :–*** pH of a buffer changes with temperature.
Reason :– Ionic product of water (K_w) changes with temperature.
Ans. (B)

15. ***Assertion :–*** H_3PO_3 is a dibasic compound.
Reason :– The two H-atom are directly attached to P.
Ans. (C)

16. ***Assertion*** **:** Boric acid behaves as a weak monobasic acid.
Reason **:** Boric acid contains hydrogen bonds in its structure.
Ans. (B)

17. ***Assertion*** **:** H_2O is amphoteric in nature.
Reason **:** H_2O can accept a proton to form H_3O^+ ion and can donate a proton to form OH^- ion.
Ans. (A)

18. ***Assertion*** **:** All Arrhenius acids are also Bronsted acids.
Reason **:** All Bronsted bases are also Lewis bases.
Ans. (C)

19. ***Assertion :–*** The buffer solution has a capacity to resist the change in pH value on addition of small amount of acid or base to it.
Reason :– pH value of buffer solution does not change on dilution or on keeping for long.
Ans. (B)

20. ***Assertion :–*** The species in the buffer must not react with each other.
Reason :– The pH of a buffer depends on the value of K_a of the weak acid and the relative concentration of that acid and its conjugate base.
Ans. (B)

21. ***Assertion :–*** Only a very small amount of indicator should be used.
Reason :– So that addition of the indicator does not effect the pH of the solution.
Ans. (A)