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 400mL of 0.1 M solution is:-
(1) 2.45 g (2) 3.92 g (3) 4.90 g (4) 9.8 g
CIE001

2. Normality of 2M sulphuric acid is:-
(1) 2 N (2) 4N (3) N/2 (4) N/4
CIE002

3. If pH = 3.31, then find out $[H^+]$ (Approx)
(1) 3.39×10^{-4} (2) 5×10^{-4}
(3) 3.0×10^{-3} (4) None
CIE003

4. If $[OH^-] = 5.0 \times 10^{-5}$ M then pH will be :-
(1) 5 – log 5 (2) 9 + log 5
(3) log 5 – 5 (4) log 5 – 9
CIE004

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
CIE005

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
CIE006

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}
CIE007

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
CIE008

9. The amount of acetic acid present in 100 mL of 0.1M solution is :-
(1) 0.30 g (2) 3.0 g (3) 0.60 g (4) None
CIE009

10. The number of milli equivalents of acid in 100 mL of 0.5N HCl solution is:-
(1) 50 (2) 100 (3) 25 (4) 200
CIE010

11. If the molar concentration of $MgCl_2$ is 1.5×10^{-3} mol L^{-1}, the concentration of chloride 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}
CIE011

OSTWALD'S DILUTION LAW

12. Degree of dissociation of 0.1 N CH_3COOH is :- (Dissociation constant = 1×10^{-5})
(1) 10^{-5} (2) 10^{-4} (3) 10^{-3} (4) 10^{-2}
CIE012

13. 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
CIE013

14. 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
CIE014

15. 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
CIE015

16. Find out K_a for 10^{-2} M HCN acid, having pOH = 10 :-
(1) $K_a = 10^{-4}$ (2) $K_a = 10^{-2}$
(3) $K_a = 10^{-5}$ (4) None of these
CIE016

17. 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
CIE017

18. The extent of ionisation of weak electrolytes increases :-
(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

CIE018

19. 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

CIE019

20. The molarity of nitrous acid solution 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

CIE020

EXPLANATION OF WATER

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

CIE021

22. For water at 25° C, 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) $[H^+] - [OH^-]$

CIE022

23. At 25^0C, the dissociation constant for pure water is given by :-
(1) $(55.4 \times 10^{14})^{-1}$ (2) 1×10^{-14}
(3) $\frac{1\times10^{-14}}{18}$ (4) None of these

CIE023

24. 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 $[H^+]$

CIE024

25. For pure water, addition of H^+ and OH^- ion concentrations at 90^0C is :-
(1) 10^{-14} (2) 10^{-12}
(3) 2×10^{-6} (4) 2×10^{-7}

CIE025

26. At a certain temperature, pure water has $[H_3O^+] = 10^{-6.7}$ mol L^{-1} .What is the value of K_W at this temperature :-
(1) 10^{-6} (2) 10^{-12}
(3) 10^{-67} (4) $10^{-13.4}$

CIE026

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

CIE027

28. 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}.

CIE028

HYDROLYSIS OF SALTS

29. At 90^0 C, the pH of 0.1M NaCl aqueous solution is:-
(1) < 7 (2) > 7 (3) 7 (4) 0.1

CIE034

30. What will be 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

CIE035

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

CIE036

32. $HCOO^- + H_2O \rightleftharpoons HCOOH + OH^-$
Degree of hydrolysis for above reaction is given by:-
(1) $h = \sqrt{K_h}$ (2) $h = \sqrt{\frac{K_h}{C}}$
(3) $h = \sqrt{\frac{K_h}{V}}$ (4) $K_h = \sqrt{hc}$

CIE037

33. The pH of aqueous solution of sodium acetate is
(1) 7 (2) Very low
(3) > 7 (4) < 7
CIE038

34. 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
CIE039

35. 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
CIE040

36. pH of K_2S solution is:-
(1) 7 (2) Less than 7
(3) More than 7 (4) 0
CIE041

37. 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
CIE042

38. Ionisation constant of a weak acid is 10^{-4}. Find out equilibrium constant for the reaction of this weak acid with strong base :-
(1) 10^{-10} (2) 10^{10} (3) 10^{-9} (4) 10^{9}
CIE043

39. 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) $[OH^-] = C. K_a. K_w.$
CIE044

40. 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
CIE045

41. Which of the following salts undergoes hydrolysis in water:-
(1) Na_3PO_4 (2) CH_3COONa
(3) $NaNO_3$ (4) Both (1) and (2)
CIE046

42. 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
CIE047

SOLUBILITY & SOLUBILITY PRODUCT (K_{SP})

43. The solubility product of sparingly soluble Uni- univalent salt (AB type) is defined as the product of ionic concentration in a:-
(1) 1 M solution
(2) Concentration solution
(3) Very dilute solution
(4) Saturated solution
CIE048

44. If solubility of salts M_2X, QY_2 and PZ_2 are 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) $K_{sp}(M_2X) = K_{sp}(QY_2) = K_{sp}(PZ_2)$
CIE049

45. 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) $[Hg^{2+}]^2 \times [I^-]^2$
CIE050

46. 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) $18 \times 10^{+10}$
CIE051

47. At 25°C, the volume of water required to dissolve 1g $BaSO_4$ ($K_{sp} = 1.0 \times 10^{-10}$) will be (Molecular weight of $BaSO_4$ = 233) :-
(1) 820 L. (2) 1 L. (3) 205 L. (4) 430 L.
CIE052

48. 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_2CrO_4 is :-
(1) 3.3750×10^{-12} (2) 1.6875×10^{-10}
(3) 1.68×10^{-12} (4) 1.6875×10^{-11}
CIE053

49. 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}
CIE054

50. 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}
CIE055

51. The solubility product of As_2S_3 is given by the expression :-
(1) $K_{sp} = [As^{3+}]\ [S^{-2}]$ (2) $K_{sp} = [As^{3+}]^1\ [S^{-2}]^1$
(3) $K_{sp} = [As^{3+}]^3\ [S^{-2}]^2$ (4) $K_{sp} = [As^{3+}]^2\ [S^{-2}]^3$
CIE056

52. 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) $2S^4$
CIE057

53. If the solubility of lithium sodium hexafluoro 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) $2916\ S^8$
CIE058

54. 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}
CIE059

APPLICATION OF SOLUBILITY PRODUCT(K_{SP})

55. 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 $AgNO_3$
CIE060

56. In which of the following, the solution of AgSCN will be unsaturated :-
(1) $[Ag^+]\ [SCN^-] = K_{sp}$ (2) $[Ag^+]\ [SCN^-] < K_{sp}$
(3) $[Ag^+]\ [SCN^-] > K_{sp}$ (4) $[Ag^+]\ [SCN^-]^2 < K_{sp}$
CIE061

57. If 's' and 'S' are solubility and solubility product of a sparingly soluble binary electrolyte respectively then :–
(1) $s = S$ (2) $s = S^2$
(3) $s = S^{1/2}$ (4) $s = \frac{1S}{2}$
CIE062

58. 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) $Ag_2S > CuS > HgS$
CIE063

59. 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
CIE064

60. 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
CIE065

61. 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})

CIE066

62. 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})

CIE067

63. 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

CIE068

64. 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

CIE069

65. The K_{sp} value for $Gd(OH)_3$ is 2.8×10^{-23}. Find the pH of saturated solution of $Gd(OH)_3$:-
(1) 6.08 (2) 5.08 (3) 8.47 (4) 4.08

CIE070

66. If the solubility product of $AgBrO_3$ and Ag_2SO_4 are 5.5×10^{-5} and 2×10^{-5} respectively, the relationship between their solubilities can be correctly represented as :-
(1) $S_{AgBrO_3} > S_{Ag_2SO_4}$ (2) $S_{AgBrO_3} = S_{Ag_2SO_4}$
(3) $S_{AgBrO_3} < S_{Ag_2SO_4}$ (4) Unpredictable

CIE071

67. 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

CIE072

68. 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, K_{sp} 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

CIE073

69. 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) Precipitation will take place
(2) Precipitation will not take place
(3) Solution will be saturated
(4) None of these

CIE074

70. The solubility product constant K_{sp} 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

CIE075

71. 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

CIE076

FEW IMPORTANT POINTS

72. Two monobasic weak acids have the same moles of H^+ ions. What is the relationship between dissociation constant and dilution:-
(1) $Ka_1V_1 = Ka_2V_2$ (2) $Ka_1V_2 = Ka_2V_1$
(3) $[Ka_1V_1]^{\frac{1}{2}} = Ka_2V_2$ (4) $Ka_1V_1 = [Ka_2V_2]^{\frac{1}{2}}$

CIE077

73. Two solutions having same concentration of H^+ ions are called:-
(1) Isotonic solutions
(2) Isohydric solutions
(3) Hypotonic solutions
(4) Hypertonic solutions

CIE078

74. 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

CIE079

pH

75. 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

CIE080

76. 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 $Ba(OH)_2$

CIE081

77. 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

CIE082

78. 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}

CIE083

79. 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

CIE084

80. 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) $\frac{M}{20}H_2SO_4$, $\frac{M}{5}HNO_3$, $\frac{M}{5}HClO_4$

CIE085

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

CIE086

82. 10^{-6} M HCl is diluted 100 times. Its pH is :-
(1) 6.0 (2) 8.0 (3) 6.95 (4) 9.5

CIE087

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

CIE088

84. At 90°C, the pH of 0.001M KOH solution will be
(1) 3 (2) 11 (3) 5 (4) 9

CIE089

85. 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

CIE090

86. 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

CIE091

87. 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

CIE092

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

CIE093

89. 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.
CIE094

90. The pOH of a solution 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
CIE095

91. An aqueous solution whose pH = 0 is :-
(1) Basic (2) Acidic
(3) Neutral (4) Amphoteric
CIE096

92. 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
CIE097

93. The pH of a 0.02 M ammonia solution which is 5% ionised will be :-
(1) 2 (2) 11 (3) 5 (4) 7
CIE098

94. For $\frac{N}{10}$ H_2SO_4, pH value is :-
(1) 1 (2) 0.586 (3) 0.856 (4) None
CIE099

95. 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
CIE100

96. 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
CIE101

97. 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
CIE102

98. 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
CIE103

99. 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
CIE104

100. 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
CIE105

101. Choose the wrong statement :-
(1) For a neutral solution : $[H^+] = [OH^-] = \sqrt{K_w}$
(2) For an acidic solution :
$[H^+] > \sqrt{K_w}$ & $[OH^-] < \sqrt{K_w}$
(3) For a basic solution :
$[H^+] < \sqrt{K_w}$ & $[OH^-] > \sqrt{K_w}$
(4) For a neutral solution :
$[H^+] = [OH^-] = 10^{-7}$ M (at all temperatures)
CIE106

102. 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
CIE107

BUFFER SOLUTIONS AND INDICATOR

103. In a buffer solution the ratio of concentration of NH_4Cl and NH_4OH is 1 : 1. When it changes to 2 : 1, pH of buffer :-
(1) Increases (2) Decreases
(3) No effect (4) None of these
CIE108

104. To 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
CIE109

105. 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

CIE110

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

CIE111

107. 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

CIE112

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

CIE113

109. 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

CIE114

110. 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

CIE115

111. 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

CIE116

112. K_a for HCN is 5 x 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

CIE117

113. 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

CIE118

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

CIE119

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

CIE120

116. 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) None of these

CIE121

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

CIE122

118. For which of the following 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

CIE123

119. 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

CIE124

120. 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
CIE125

121. 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
CIE126

122. 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
CIE127

123. Phenolphthalein is not a good indicator for titrating
(1) NaOH against oxalic acid
(2) NaOH against HCl
(3) NaOH against H_2SO_4
(4) HCl against NH_4OH
CIE128

124. 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) $CH_3COOH + CH_3COONa$
CIE129

125. 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
CIE130

126. 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
CIE131

127. 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
CIE132

128. 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
CIE133

129. Henderson equation pH – pK_a = 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
CIE134

130. 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: $K_b(NH_4OH) = 1.8 \times 10^{-5}$
(1) 3.0×10^{-3} (2) 9.0×10^{-4}
(3) 9.0×10^{-3} (4) 3.0×10^{-4}
CIE135

131. 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
CIE136

132. 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 $NH_3 = 1.8 \times 10^{-5}$:-
(1) 8.1187 (2) 9.8117
(3) 8.8117 (4) None of these
CIE137

133. Calculate the ratio of pH of a solution containing 1 mole of CH_3COONa + 1 mole of HCl per litre and of other solution containing 1 mole CH_3COONa + 1mole of acetic acid per litre :-
(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) 2 : 3
CIE138

134. 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

CIE139

135. 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

CIE140

136. $\frac{N}{10}$ acetic acid was titrated with $\frac{N}{10}$ NaOH. When 25%, 50% and 75% of titration is over then the pH of 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

CIE141

ACID AND BASE

137. The conjugate acid of O^{-2} is :-
(1) O_2^+ (2) H^+ (3) H_3O^+ (4) OH^-

CIE142

138. Ionization constant of AOH and BOH base are K_{b_1} and K_{b_2}. Their relation is $pK_{b_1} < pK_{b_2}$. Conjugate of following base, does not show maximum pH :
(1) AOH (2) BOH
(3) Both of them (4) None of these

CIE143

139. 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

CIE144

140. 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^-

CIE145

141. An example of Lewis acid is:-
(1) CaO (2) CH_3NH_2
(3) SO_3 (4) None of these

CIE146

142. In the reaction $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ water behaves as :-
(1) Acid (2) Base
(3) Neutral (4) Both acid & Base

CIE147

143. 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

CIE148

144. 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

CIE149

145. The conjugate base of $(CH_3)_2\overset{+}{N}H_2$ is :-
(1) CH_3NH_2 (2) $(CH_3)_2N^+$
(3) $(CH_3)_2N$ (4) $(CH_3)_2NH$

CIE150

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

CIE151

147. Conjugate base of hydrazoic acid is :-
(1) HN_3^- (2) N_3^- (3) N^{3-} (4) N_2^-

CIE152

148. 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

CIE153

149. 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
CIE154

150. The strongest acid among the following is -
(1) $ClO_3(OH)$ (2) $ClO_2(OH)$
(3) $SO(OH)_2$ (4) $SO_2(OH)_2$
CIE155

151. Which of the following is not a Bronsted acid:-
(1) $CH_3NH_4^+$ (2) CH_3COO^-
(3) H_2O (4) HSO_4^-
CIE156

152. Which of the following example behave as a Lewis acid BF_3, $SnCl_2$, $SnCl_4$:-
(1) $SnCl_2$, $SnCl_4$ (2) BF_3, $SnCl_2$
(3) Only BF_3 (4) BF_3, $SnCl_2$, $SnCl_4$
CIE157

153. 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^-
CIE158

154. 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^+
CIE159

155. In the reaction, $AlCl_3 + Cl^- \rightarrow [AlCl_4]^-$, $AlCl_3$ acts as :-
(1) Salt (2) Lewis base
(3) Bronsted acid (4) Lewis acid
CIE160

156. Mg^{2+} is _____ than Al^{3+} :-
(1) Stronger Lewis acid
(2) Stronger Lewis base
(3) Weaker Lewis acid
(4) Weaker Lewis base
CIE161

157. 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-}
CIE162

158. 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
CIE163

159. Which of the following is not a lewis base:-
(1) NH_3 (2) O^{2-} (3) H_2O (4) I^+
CIE164

160. Which of the following is Bronsted Lowry acid:-
(1) SO_4^{-2} (2) H_3O^+ (3) OH^- (4) Cl^-
CIE165

161. The conjugate base for bicarbonate ion is:-
(1) CO_3^{2-} (2) HCO_3^-
(3) CO_2 (4) H_2CO_3
CIE166

162. HCl does not behave as acid in :-
(1) NH_3 (2) C_2H_5OH
(3) H_2O (4) C_6H_6
CIE167

163. Which of the following is a base according to Bronsted-Lowry concept :-
(1) I^- (2) H_3O^+ (3) HCl (4) NH_4^+
CIE168

164. 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
CIE169

165. According to Bronsted concept, the acids in the following reaction $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ are :-
(1) NH_3 and NH_4^+ (2) H_2O and OH^-
(3) H_2O and NH_4^+ (4) NH_3 and OH^-
CIE170

166. CH_3COO^- ion is a :-
(1) Weak conjugate base
(2) Strong conjugate base
(3) Weak conjugate acid
(4) Strong conjugate acid
CIE171

167. Which of the following is strongest conjugate base
(1) ClO_4^- (2) HCO_3^- (3) Cl^- (4) HSO_4^-
CIE172

168. Which of the following species can act as Lewis base :-
(1) Cu^{2+} (2) $AlCl_3$ (3) NH_3 (4) BF_3
CIE173

169. A compound having the formula NH_2CH_2COOH may behave :-
(1) Only as an acid
(2) Only as a base
(3) Both as an acid and base
(4) Neither acid nor base
CIE174

170. 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
CIE175

171. The strongest conjugate base is :-
(1) NO_3^- (2) Cl^-
(3) SO_4^{2-} (4) CH_3COO^-
CIE176

172. Aluminium chloride is :-
(1) Bronsted Lowry acid
(2) Arrhenius acid
(3) Lewis acid
(4) Lewis base
CIE177

173. Water is a :-
(1) Protogenic solvent
(2) Protophilic solvent
(3) Amphiprotic solvent
(4) Aprotic solvent
CIE178

174. Ammonium ion is :-
(1) A conjugate acid
(2) A conjugate base
(3) Neither an acid nor a base
(4) Both an acid and a base
CIE179

175. 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}
CIE180

176. 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
CIE181

177. 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
CIE182

178. 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
CIE183

179. According to Arrhenius theory, acids are substances that dissociate in water to give ...(X) ... ions and bases are substances that produce ...(Y).... ions. Here, (X) and (Y) refer to
(1) Hydronium, Hydroxyl
(2) Hydroxyl, Hydrogen
(3) Hydrogen, Hydroxyl
(4) Hydroxyl, Hydronium
CIE184

180. 'An acid is substance that is capable of donating a proton (H^+) and base is a substance capable of accepting a proton (H^+). The above statement is justified by
(1) Arrhenius concept
(2) Bronsted-Lowry theory
(3) Lewis concept
(4) All of these
CIE185

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	2	2	2	4	4	2	1	3	1	1	4	1	1	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	1	3	4	4	4	1	1	1	3	4	1	4	1	1
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	4	2	3	3	3	3	3	2	3	3	4	4	4	4	3
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	2	4	3	3	3	4	3	4	1	2	2	3	4	4	2
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	2	4	2	4	3	3	1	2	2	4	3	2	2	2	4
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	3	3	1	4	3	2	3	2	4	3	1	4	2	2	4
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	2	3	2	1	2	3	2	3	3	1	4	4	2	3	4
Question	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	1	4	3	3	3	3	3	1	1	1	3	4	3	1	1
Question	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Answer	2	2	4	3	1	1	1	1	2	2	1	3	3	4	1
Question	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Answer	1	4	2	1	4	3	1	1	2	4	4	2	1	2	1
Question	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Answer	2	4	3	2	4	3	3	4	4	2	1	4	1	3	3
Question	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Answer	2	2	3	3	4	4	3	3	1	2	1	1	2	3	2

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2014

1. Which of the following salts will give highest pH in water ?
(1) KCl (2) NaCl (3) Na_2CO_3 (4) $CuSO_4$
CIE196

AIPMT 2015

2. The K_{sp} of Ag_2CrO_4, AgCl, AgBr and AgI are respectively, 1.1×10^{-12}, 1.8×10^{-10}, 5.0×10^{-13}, 8.3×10^{-17}. Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr, NaI and Na_2CrO_4 ?
(1) AgCl (2) AgBr
(3) Ag_2CrO_4 (4) AgI
CIE197

Re-AIPMT 2015

3. Which one of the following pairs of solution is not an acidic buffer ?
(1) H_2CO_3 and Na_2CO_3
(2) H_3PO_4 and Na_3PO_4
(3) $HClO_4$ and $NaClO_4$
(4) CH_3COOH and CH_3COONa
CIE198

4. What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed?
(1) 7.0 (2) 1.04 (3) 12.65 (4) 2.0
CIE199

NEET-I 2016

5. MY and NY_3, two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be **true** in regard to MY and NY_3 ?
(1) The molar solubilities of MY and NY_3 in water are identical.
(2) The molar solubility of MY in water is less than that of NY_3
(3) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.
(4) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.
CIE200

NEET-II 2016

6. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution
(K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is
(1) 0.77% (2) 1.6%
(3) 0.0060% (4) 0.013%
CIE201

7. The solubility of AgCl(s) with solubility product
1.6×10^{-10} in 0.1 M NaCl solution would be
(1) 1.6×10^{-11} M (2) zero
(3) 1.26×10^{-5} M (4) 1.6×10^{-9} M
CIE202

NEET(UG) 2017

8. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} mol L^{-1} Solubility product of $Ag_2C_2O_4$ is :-
(1) 2.66×10^{-12} (2) 4.5×10^{-11}
(3) 5.3×10^{-12} (4) 2.42×10^{-8}
CIE203

NEET(UG) 2018

9. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

a. $60mL\frac{M}{10}HCl + 40mL\frac{M}{10}NaOH$

b. $55mL\frac{M}{10}HCl + 45mL\frac{M}{10}NaOH$

c. $75mL\frac{M}{5}HCl + 25mL\frac{M}{5}NaOH$

d. $100mL\frac{M}{10}HCl + 100mL\frac{M}{10}NaOH$

pH of which one of them will be equal to 1 ?
(1) b (2) a (3) d (4) c
CIE204

10. The solubility of $BaSO_4$ in water 2.42×10^{-3} gL^{-1} at 298 K. The value of solubility product (K_{sp}) will be (Given molar mass of $BaSO_4$ = 233 g mol^{-1})
(1) 1.08×10^{-10} mol^2 L^{-2}
(2) 1.08×10^{-12} mol^2 L^{-2}
(3) 1.08×10^{-14} mol^2 L^{-2}
(4) 1.08×10^{-8} mol^2 L^{-2}
CIE205

NEET(UG) 2019

11. pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is :-
(1) 0.5×10^{-15} (2) 0.25×10^{-10}
(3) 0.125×10^{-15} (4) 0.5×10^{-10}
CIE206

12. Which will make basic buffer ?
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1M NaOH
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

CIE207

NEET(UG) (Odisha) 2019

13. The pH of 0.01 M NaOH (aq) solution will be
(1) 7.01 (2) 2 (3) 12 (4) 9

CIE208

14. Which of the following cannot act both as Bronsted acid and as Bronsted base ?
(1) HCO_3^- (2) NH_3 (3) HCl (4) HSO_4^-

CIE209

15. The molar solubility of CaF_2 ($K_{sp} = 5.3 \times 10^{-11}$) in 0.1 M solution of NaF will be
(1) 5.3×10^{-11} mol L^{-1} (2) 5.3×10^{-8} mol L^{-1}
(3) 5.3×10^{-9} mol L^{-1} (4) 5.3×10^{-10} mol L^{-1}

CIE210

NEET (UG) 2020

16. Find out the solubility of $Ni(OH)_2$ in 0.1M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.
(1) 1×10^8 M (2) 2×10^{-13} M
(3) 2×10^{-8} M (4) 1×10^{-13} M

CIE211

NEET (UG) 2020 (COVID-19)

17. Which among the following salt solutions is basic in nature ?
(1) Ammonium chloride
(2) Ammonium sulphate
(3) Ammonium nitrate
(4) Sodium acetate

CIE212

18. The solubility product for a salt of the type AB is 4×10^{-8}. What is the molarity of its standard solution?
(1) 2×10^{-4} mol/L (2) 16×10^{-16} mol/L
(3) 2×10^{-16} mol/L (4) 4×10^{-4} mol/L

CIE213

NEET (UG) 2021

19. The pK_b of dimethylamine and pK_a of acetic acid are 3.27 and 4.77 respectively at T (K). The correct option for the pH of dimethylammonium acetate solution is:
(1) 8.50 (2) 5.50 (3) 7.75 (4) 6.25

CIE214

NEET (UG) 2022

20. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is [Given pK_a of CH_3COOH = 4.57]
(1) 3.57 (2) 4.57 (3) 2.57 (4) 5.57

CIE215

21. 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is :
(1) 3 (2) 2 (3) 4 (4)1

CIE216

NEET (UG) 2024 (Re-examination)

22. Which indicator is used in the titration of sodium hydroxide against oxalic acid and what is the colour change at the end point ?
(1) Phenolphthalein, pink to yellow
(2) Alkaline $KMnO_4$, colourless to pink
(3) Phenolphthalein, colourless to pink
(4) Methyl orange, yellow to pinkish red colour

CIE274

23. The ratio of solubility of AgCl in 0.1 M KCl solution to the solubility of AgCl in water is :
(Given : Solubility product of AgCl = 10^{-10})
(1) 10^{-4} (2) 10^{-6} (3) 10^{-9} (4) 10^{-5}

CIE275

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	3	3	3	2	4	4	3	4	1	1	3	3	3	3
Question	16	17	18	19	20	21	22	23							
Answer	2	4	1	3	4	3	3	1							

Exercise – III (Analytical Questions) Master Your Understanding

1. Given below are two statements:
Statement-I : During hydrolysis of CH_3COONH_4, the ions formed undergo hydrolysis as follow :

$$CH_3COO^- + NH_4^+ + H_2O \rightleftharpoons CH_3COOH + NH_4OH$$

Statement-II : The degree of hydrolysis of CH_3COONH_4 is independent of concentration of solution.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement-I & statement-II both are correct
(2) Only statement-I is correct
(3) Only statement-II is correct
(4) Statement-I & statement-II both are incorrect

CIE217

2. Arrange the following solutions in the decreasing order of pH :
(A) 0.01 M HCl
(B) 0.01 M NaOH
(C) 0.01 M CH_3COONa
(D) 0.01 M NaCl
(1) (B) > (D) > (C) > (A)
(2) (B) > (C) > (D) > (A)
(3) (A) > (C) < (D) > (B)
(4) (A) > (D) > (C) > (B)

CIE220

3. Given below are two statements:
Statement-I : Solubility of AgBr decreases in the presence of NaBr.
Statement-II : NaBr undergoes hydrolysis in water.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement-I and statement-II are incorrect.
(2) Statement-I and statement-II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CIE222

4. Statement-I : Acids turn red litmus paper blue.
Statement-II : Acids taste bitter and feel soapy.
(1) Statement-I and statement-II are incorrect.
(2) Statement-I and statement-II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CIE223

5. Given below are two statements:
Statement-I : Conjugate acid and conjugate base of NH_3 respectively are NH_4^+ and NH_2^-.
Statement-II : The acid base pair that differs only by one proton is called a conjugate acid base pair.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement-I and statement-II are incorrect.
(2) Statement-I and statement-II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CIE224

6. Given below are two statements:
Statement-I : The cations of strong bases and anions of strong acids simply get hydrolyse but do not get hydrated.
Statement-II : The solutions of salts formed from strong acids & bases are neutral.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement-I and statement-II are incorrect.
(2) Statement-I and statement-II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CIE225

7. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion : All Arrhenius acids are Bronsted acids.

Reason : All Bronsted acids are Arrhenius acids.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) (A) is correct but (R) is not correct

(2) Both (A) and (R) are correct and (R) is correct explanation of (A)

(3) Both (A) and (R) are correct but (R) is not correct explanation of (A)

(4) (A) is not correct but (R) is correct

CIE227

8. Match the Column – I and Column - II

	Column-I		**Column-II**
	(Species)		**(Conjugate acid)**
(a)	NH_3	(p)	H_2CO_3
(b)	HCO_3^-	(q)	H_2SO_4
(c)	H_2O	(r)	NH_4^+
(d)	HSO_4^-	(s)	H_3O^+

(1) (a) → (r); (b) → (p); (c) → (s); (d) → (q)

(2) (a) → (p); (b) → (r); (c) → (q); (d) → (s)

(3) (a) → (r); (b) → (s); (c) → (p); (d) → (q)

(4) (a) → (q); (b) → (p); (c) → (r); (d) → (s)

CIE228

9. Match the Column – I and Column - II

	Column-I		**Column-II**
(a)	$Al(OH)_3$	(p)	$S=\left(\frac{K_{sp}}{6912}\right)^{1/7}$
(b)	$BaCrO_4$	(q)	$S=\left(\frac{K_{sp}}{4}\right)^{1/3}$
(c)	$Zr_3(PO_4)_4$	(r)	$S=\left(\frac{K_{sp}}{27}\right)^{1/4}$
(d)	Hg_2I_2	(s)	$S=(K_{sp})^{1/2}$

(1) (a) → (r); (b) → (s); (c) → (p); (d) → (q)

(2) (a) → (s); (b) → (p); (c) → (r); (d) → (q)

(3) (a) → (p); (b) → (q); (c)→ (s); (d) → (r)

(4) (a) → (q); (b) → (r); (c) → (p); (d) → (s)

CIE229

10. If concentrations of two acids are same, their relative strengths can be compared by :

(a) $\frac{\alpha_1}{\alpha_2}$ (b) $\frac{[H^+]_1}{[H^+]_2}$

(c) $\sqrt{\frac{K_1}{K_2}}$ (d) $\frac{K_1}{K_2}$

(1) a, c, d are correct (2) a, b, c are correct

(3) b, c, d are correct (4) All are correct

CIE230

11. Which can act as a buffer ?

(a) CH_3COOH + NaOH; if $[CH_3COOH] > [NaOH]$

(b) HCl + CH_3COONa; if $[CH_3COONa] > [HCl]$

(c) HCl + NaCl

(d) NH_4CN

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

CIE231

12. Given below are two statements:

Statement-I : pH of a 1.0×10^{-8} M solution of HCl is 8 at 25°C.

Statement-II : HCl is a strong acid and negative log of H^+ concentration is called pH.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Statement-I and statement-II are incorrect.

(2) Statement-I and statement-II are correct.

(3) Statement-I is incorrect but statement-II is correct.

(4) Statement-I is correct but statement-II is incorrect

CIE233

13. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion : Water act as base in the reaction

$HCl(aq.) + H_2O(\ell) \rightleftharpoons H_3O^+(aq.) + Cl^-(aq.)$

Reason : According to Bronsted-lowry proton acceptors are known as base.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) (A) is correct but (R) is not correct
(2) Both (A) and (R) are correct and (R) is correct explanation of (A)
(3) Both (A) and (R) are correct but (R) is not correct explanation of (A)
(4) (A) is not correct but (R) is correct

CIE234

14. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .
Assertion : pH of NH_4Cl solution in water is less than 7 at 25°C.
Reason : Ammonium hydroxide is a strong base.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) (A) is correct but (R) is not correct
(2) Both (A) and (R) are correct and (R) is correct explanation of (A)
(3) Both (A) and (R) are correct but (R) is not correct explanation of (A)
(4) (A) is not correct but (R) is correct

CIE235

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Answer	1	2	4	1	2	3	1	1	1	2	1	3	2	1	