Single correct

Q.1 The conjugate acid of NH_2^- is

(A) NH_3 (B) NH_2OH (C) NH_4^+ (D) N_2H_4

Q.2 Which of the following is not a Bronsted acid:-

(A) $CH_3NH_4^+$ (B) CH_3COO^- (C) H_2O (D) HSO_4^-

Q.3 In the reaction

$HNO_3 + H_2O \rightleftharpoons H_3O^+ + NO_3^-$, the conjugate base of HNO_3 is :-

(A) H_2O (B) H_3O^+ (C) NO_3^- (D) H_3O^+ and NO_3^-

Q.4 Out of the following, amphiprotic species in aqueous medium are

I: HPO_3^{2-} II OH^- III $H_2PO_4^-$ IV HCO_3^-

(A) I, III, IV (B) I and III (C) III and IV (D) All

Q.5 When ammonia is added to water it decreases the concentration of which of the following ion

(A) OH^- (B) H_3O^+ (C) NH_4^+ (D) NH_4^+ & OH^-

Q.6 Which of the following pair is Lewis acid & Lewis base & Product of these is also Lewis base

(A) BF_3 , NH_3 (B) $SiCl_4$, $2Cl^-$ (C) $CH_3^{\oplus}$, $^{\ominus}OC_2H_5$ (D) All of these

Q.7 Degree of dissociation of 0.1 N CH_3COOH is :- (Dissociation constant = 1×10^{-5})

(A) 10^{-5} (B) 10^{-4} (C) 10^{-3} (D) 10^{-2}

Q.8 Ionic product of water will increase, if :-

(A) Pressure is decreased (B) H^+ is added

(C) OH^- is increased (D) Temperature is increased

Q.9 At 60°C, pure water has $[H_3O^+]=10^{-6.7}$mol/lit. what is the value of K_W at 60°C :-

(A) 10^{-6} (B) 10^{-12} (C) 10^{-67} (D) $10^{-13.4}$

Q.10 The pH of solution is increased from 3 to 6. Its H^+ ion conc. will be :-

(A) Reduced to half (B) Doubled

(C) Reduced by 1000 times (D) Increased by 1000 times

Q.11 The pH of a 0.02 M ammonia solution which is 5% ionised will be :-

(A) 2 (B) 11 (C) 5 (D) 7

Q.12 The concentration of $[H^+]$ and concentration of $[OH]^-$ of a 0.1 M aqueous solution of 2% ionised weak acid is [ionic product of water $=1 \times 10^{-14}$]

(A) 0.02×10^{-3} M and 5×10^{-11} M (B) 1×10^{-3} M and 3×10^{-11} M

(C) 2×10^{-3} M and 5×10^{-12} M (D) 3×10^{-2} M and 4×10^{-13} M

Q.13 An aqueous solution of HCl is 10^{-9} M HCl. The pH of the solution should be:-

(A) 9 (B) Between 6 and 7 (C) 7 (D) Unpredictable

Q.14 8 gm NaOH and 4.9 gm H_2SO_4 are present in one litre of the solution. What is its pH

(A) 1 (B) 13 (C) 12 (D) 2

Q.15 What is the quantity of NaOH present in 250 cc of the solution, so that it gives a pH = 13 :-

(A) 10^{-13} g (B) 10^{-1} g (C) 1.0 g (D) 4.0 g

Q.16 Which one of the following has highest pH:-

(A) Distilled water (B) 1 M NH_3

(C) 1 M NaOH (D) Water saturated with chlorine

Q.17 pH of an aqeous solution of NaCl at 85°C should be

(A) 7 (B) > 7 (C) < 7 (D) 0

Q.18 1 cc of 0.1 N HCl is added to 99 cc solution of NaCl. The pH of the resulting solution will be

(A) 7 (B) 3 (C) 4 (D) 1

Q.19 10 ml of $\frac{M}{200}$ H_2SO_4 is mixed with 40 ml of $\frac{M}{200}$ H_2SO_4. The pH of the resulting solution is

(A) 1 (B) 2 (C) 2.3 (D) none of these

Q.20 If pK_b for fluoride ion at 25° C is 10.83, the ionisation constant of hydrofluoric acid in water at this temperature is :

(A) 1.74×10^{-5} (B) 3.52×10^{-3} (C) 6.75×10^{-4} (D) 5.38×10^{-2}

Q.21 The pH of an aqueous solution of 1.0 M solution of a weak monoprotic acid which is 1% ionised is

(A) 1 (B) 2 (C) 3 (D) 11

Q.22 Which of the following solution will have pH close to 1.0?

(A) 100 ml of M/100 HCl + 100 ml of M/10 NaOH

(B) 55 ml of M/10 HCl + 45 ml of M/10 NaOH

(C) 10 ml of M/10 HCl + 90 ml of M/10 NaOH

(D) 75 ml of M/5 HCl + 25 ml of M/5 NaOH

Q.23 A solution with pH 2.0 is more acidic than the one with pH 6.0 by a factor of:

(A) 3 (B) 4 (C) 3000 (D) 10000

Q.24 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 :

(A) 5.0×10^{-5} (B) 5.0×10^{15} (C) 5.0×10^{-15} (D) 0.2×10^{5}

Q.25 The degree of hydrolysis of a salt of weak acid and weak base in it's 0.1 M solution is found to be 50%. If the molarity of the solution is 0.2 M, the percentage hydrolysis of the salt should be

(A) 100% (B) 50% (C) 25% (D) none of these

Q.26 What is the percentage hydrolysis of NaCN in N/80 solution when the dissociation constant for HCN is 1.3×10^{-9} and $K_w = 1.0 \times 10^{-14}$

(A) 2.48 (B) 5.26 (C) 8.2 (D) 9.6

Q.27 The compound whose 0.1 M solution is basic is

(A) Ammonium acetate (B) Ammonium chloride

(C) Ammonium sulphate (D) Sodium acetate

Q.28 If equilibrium constant of

$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

Is 1.8×10^{-5}, equilibrium constant for

$CH_3COOH + OH^- \rightleftharpoons CH_3COO^- + H_2O$ is

(A) 1.8×10^{-9} (B) 1.8×10^{9} (C) 5.55×10^{-9} (D) 5.55×10^{10}

Q.29 The pK_a of a weak acid, HA, is 4.80. The pK_b of a weak base, BOH, is 4.78. The pH of an aqueous solution of the corresponding salt, BA, will be :

(A) 8.58 (B) 4.79 (C) 7.01 (D) 9.22

Q.30 The highest pH value is of :-

(A) 0.1 M NaCl (B) 0.1 M NH_4Cl

(C) 0.1 M CH_3COONa (D) 0.1 M CH_3COONH_4

Q.31 pH of K_2S solution is:-

(A) 7 (B) Less than 7 (C) More than 7 (D) 0

Q.32 Degree of Hydrolysis of $\frac{N}{100}$ solution of KCN is (Given Ka = 1.4×10^{-9})

(A) 2.7×10^{-3} (B) 2.7×10^{-2} (C) 2.7×10^{-4} (D) 2.7×10^{-5}

Q.33 A solution of $FeCl_3$ in water acts as acidic due to :-

(A) Acidic impurities (B) Ionisation (C) Hydrolysis of Fe^{3+} (D) Dissociation

Q.34 If 40 ml of 0.2 M KOH is added to 160 ml of 0.1 M HCOOH [$K_a = 2 \times 10^{-4}$], the pOH of the resulting solution is

(A) 3.4 (B) 3.7 (C) 7 (D) 10.3

Q.35 1 M NaCl and 1M HCl are present in an aqueous solution. The solution is

(A) not a buffer solution and with pH < 7

(B) not a buffer solution with pH > 7

(C) a buffer solution with pH < 7

(D) a buffer solution with pH > 7

Q.36 The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA in which 50% of the acid is ionized is :

(A) 4.5 (B) 2.5 (C) 9.5 (D) 7.0

Q.37 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 3.7) (log2 = 0.3)

HCOOH + HCOONa →
2.5 mm 0.1V

$pH = pK_a + \log \frac{0.1V}{2.5}$

(A) 40 ml. (B) 4 ml. (C) 50 ml. (D) 100 ml.

Q.38 Which can act as buffer :-

(A) NH_4OH + NaOH

(B) HCOOH + HCl

(C) 40 ml. of 0.1 M NaCN + 20 ml. of 0.1 M HCl

HCl + NaCN → NaCl + HCN (X)

(D) All of them

Q.39 **Read the following :**

(i) From an equimolar solution of Cl^- and Br^- ions, the addition of Ag^+ will selectively precipitates Br^- ion (K_{sp} of AgCl & AgBr are 1×10^{-10} & 1×10^{-13} respectively).

(ii) The pH of a solution which is 0.1 M in sodium acetate and 0.01 M in acetic acid (pK_a = 4.74) would be 5.74.

(iii) AgCl is less soluble in aqueous sodium chloride solution than in pure water.

(iv) In the reaction $I_2 + I^- \longrightarrow I_3^-$, I_2 acts as Lewis acid

Select the correct code for above.

(A) TFTT (B) TTTT (C) FTFT (D) FTTT

Q.40 If equal volume of 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 :
$K_b(NH_4OH) = 1.8 \times 10^{-5}$
(A) 3.0×10^{-3} (B) 9.0×10^{-4} (C) 9.0×10^{-3} (D) 3.0×10^{-4}

Q.41 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 $NH_3 = 1.8 \times 10^{-5}$, $\left(\log\left(\frac{25}{16.2}\right) = 0.188\right)$
(A) 8.1187 (B) 9.8117 (C) 8.812 (D) 7.812

Q.42 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:-
(A) 7.74 (B) 4.74 (C) 2.37 (D) 9.26

Q.43 K_a, for HCN is 5×10^{-10} at 25°C. For maintaining a constant pH of 9, the volume of 5M KCN solution required to be added to 10ml. of 2M HCN solution is-
(A) 4 ml (B) 7.95 ml (C) 2 ml (D) 9.3 ml

Q.44 50 ml. of 2N acetic acid mixed with 10 ml. of 1N sodium acetate solution will have an approximate pH of ($K_a = 10^{-5}$) :-
(A) 4 (B) 5 (C) 6 (D) 7

Q.45 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 :-
(A) More than 4.7 but less than 5.0 (B) Less than 4.7 but more than 4.0
(C) More than 5.0 (D) Remains unchanged

Q.46 Henderson equation $pH - pK_a = 5$ will be applicable to an acidic buffer when :-
(A) [Acid] = [Conjugate base] (B) [Acid] $\times 10^5$ = [Conjugate base]
(C) [Acid] = [Conjugate base] $\times 10^5$ (D) [acid] = 2 [conjugate base]

Q.47 What amount of sodium propanoate should be added to one litre of an aqueous solution containing 0.02 mole of propanoic acid ($K_a = 1.34 \times 10^{-5}$ at 25°C) to obtain a buffer solution of pH 4.75 ($10^{1/4} = 1.78$)
(A) 4.52×10^{-2} mol (B) 3.52×10^{-2} mol
(C) 2.52×10^{-2} mol (D) 1.5×10^{-2} mol

Q.48 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:-
(A) Increase (B) Decrease (C) No effect (D) None

Q.49 The buffer solution play an important role in :-
(A) Increasing the pH value (B) Decreasing the pH value
(C) Keeping the pH constant (D) Solution will be neutral

Q.50 The total number of different kind of acidic buffers obtained during the titration of H_3PO_4 with NaOH are :-
(A) 3 (B) 1 (C) 2 (D) 0

Q.51 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 :-

(A) Colloidal (B) Buffer action (C) Acidity (D) Salt balance

Q.52 Which of the following solutions does not act as buffer :–

(A) $H_3PO_4 + NaH_2PO_4$ (B) $NaHCO_3 + H_2CO_3$

(C) $NH_4Cl + HCl$ (D) $CH_3COOH + CH_3COONa$

Q.53 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)

(A) 3.6990 (B) 10.3010 (C) 3.85 (D) 4.3010

Q.54 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 :-

(A) 0.4 (B) 0.05 (C) – 0.05 (D) 2.5

Q.55 $\frac{N}{10}$ 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 :-[$K_a = 10^{-5}$]

(A) 5 + log 1/3, 5, 5 + log 3 (B) 5 + log 3, 4, 5 + log 1/3

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

Q.56 When 20 ml of $\frac{M}{20}$ NaOH are added to 10 ml of $\frac{M}{10}$ HCl, the resulting solution will:-

(A) Turn blue litmus red

(B) Turn phenolphthalein solution pink colour

(C) Turn methyl orange red

(D) Will have no effect on either red or blue litmus

Q.57 The rapid change of pH near the stoichiometric point of an acid–base titration is the basis of indicator detection. pH of the solution is related to ratio of the concentrations of the conjugate acid (HIn) and base (In^-) forms of the indicator by the expression :-

(A) $\log \frac{[HIn]}{[In^-]} = pK_{In} - pH$ (B) $\log \frac{[HIn]}{[In^-]} = pH - pK_{In}$

(C) $\log \frac{[In^-]}{[HIn]} = pH + pK_{In}$ (D) $\log \frac{[In^-]}{[HIn]} = pK_{In} - pH$

Q.58 Calculate the pH range in which an acid indicator with K_{acid} (indicator) = 1.0×10^{-5} changes colour when the concentration of the indicator is 1×10^{-3}M.

(A) 5 ± 1 (B) 11 ± 1 (C) 3 ± 1 (D) 8 ± 1

Q.59 In what pH range will a 1×10^{-4} M solution of an indicator will K_b (indicator) = 1×10^{-11} change colour?

(A) 7.0 ± 1 (B) 3.0 ± 1 (C) 5.5 ± 1 (D) 11.0 ± 1

Q.60 An acid-base indicator has a $K_a = 1.0 \times 10^{-5}$. The acid form of the indicator is red and the basic form is blue. Calculate the pH change required to change the colour of the indicator from 80% red to 80% blue.

(A) 1.20 (B) 0.80 (C) 0.20 (D) 1.40

Q.61 Indicator which is used in the titration of CH_3COOH & NaOH :–
(A) Methyl orange (B) Methyl red (C) Phenolphthalein (D) Litmus

Q.62 Phenolphthalien is a :-
(A) Strong acid (B) Strong base (C) Weak base (D) Weak acid

Q.63 pH–range of Methyl red indicator is :–
(A) 4·2–6·2 (B) 6·8–10·8 (C) 8 – 9·6 (D) 6·8 – 8·2

Q.64 In the volumetric estimation of HCl, if we make use of phenolphthalein as an indicator, which base is unsuitable for the titration :-
(A) NaOH (B) RbOH (C) KOH (D) NH_4OH

Q.65 What is the suitable indicator for titration of NaOH and oxalic acid:-
(A) Methyl orange (B) Methyl red (C) Phenolphthalein (D) None

Q.66 Phenolphthalein does not act as an indicator for the titration between :-
(A) KOH and H_2SO_4 (B) NaOH and CH_3COOH
(C) Oxalic acid and $KMnO_4$ (D) $Ba(OH)_2$ and HCl

Q.67 Which indicator works in the pH range 8 – 9.8:-
(A) Phenolphthalein (B) Methyl orange (C) Methyl red (D) Litmus

Q.68 For weak acid and strong base titration, the indicator used is :-
(A) Potassium di-chromate (B) Methyl orange
(C) Litmus (D) Phenolphthalein

Q.69 The solubility of A_2X_3 is y mol dm^{-3}. Its solubility product is
(A) $6\ y^2$ (B) $64\ y^4$ (C) $36\ y^5$ (D) $108\ y^5$

Q.70 If K_{sp} for $HgSO_4$ is 6.4×10^{-5}, then solubility of this substance in mole per m^3 is
(A) 8×10^{-3} (B) 6.4×10^{-5} (C) 8×10^{-6} (D) 8

Q.71 Solid $Ba(NO_3)_2$ is gradually dissolved in a 1.0×10^{-4} M Na_2CO_3 solution. At what concentration of Ba^{2+} will a precipitate begin to form ? (K_{sp} for $BaCO_3 = 5.1 \times 10^{-9}$)
(A) 4.1×10^{-5} M (B) 5.1×10^{-5} M (C) 8.1×10^{-8} M (D) 8.1×10^{-7} M

Q.72 If the solubility of AgCl (formula mass=143) in water at 25°C is 1.43×10^{-4} gm./100 ml. of solution then the value of K_{sp} will be :–
(A) 1×10^{-5} (B) 2×10^{-5} (C) 1×10^{-10} (D) 2×10^{-10}

Q.73 One litre of saturated solution of $CaCO_3$ is evaporated to dryness, 7.0 g of residue is left. The solubility product for $CaCO_3$ is:-
(A) 4.9×10^{-3} (B) 4.9×10^{-5} (C) 4.9×10^{-9} (D) 4.9×10^{-7}

Q.74 At 30°C, In which of the one litre solution, the solubility of Ag_2CO_3 (solubility product=8×10^{-12}) will be maximum :-
(A) 0.05 M Na_2CO_3 (B) Pure water (C) 0.05 M $AgNO_3$ (D) 0.05 M NH_3

Q.75 **Read the following :**
(i) An equimolar solution of $NaNO_2$ and HNO_2 can act as a Buffer solution.
(ii) Between Na^+ & Ag^+ ion, Ag^+ is a stronger Lewis acid.
(iii) Salts of strong acids and weak bases undergo cationic hydrolysis.
(iv) If the salts M_2X, QY_2 and PZ_3 have same solubilities (<<<1), their K_{sp} values are related as $M_2X = QY_2 > PZ_3$
Select the correct code for above.
(A) TFTT (B) FTFT (C) TTTT (D) FTTT

Q.76 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 :-

(A) 9 (B) 5 (C) 3 (D) 7

Q.77 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} of $Mg(OH)_2 = 8.9 \times 10^{-12}$)

(A) ppt will take place (B) ppt will not take place

(C) Solution will be saturated (D) None of these

Q.78 **Read the following :**

(i) When a solution of a weak monoprotic acid is titrated against a strong base, at half-neutralization point, $pH = \frac{1}{2} pK_a$.

(ii) A buffer has maximum buffer capacity when the ratio of salt to acid is 10.

(iii) In a mixture of waek acid and its salt, the ratio of concentration of salt to acid is increased ten fold. The pH of the solution would Increase by one unit.

(iv) An aqueous solution of K_2SO_4 has pH nearly equal to 7.

Select the correct code for above.

(A) TTTT (B) TFTT (C) FTFT (D) FFTT

Q.79 **Read the following :**

(i) K_a for an acid HA is 1×10^{-6}. K_b for A^- would be 10^{-8}

(ii) The conjugate acid of sulphate (SO_4^{2-}) is HSO_4^-

(iii) The value of K_w increases with increase in temperature.

(iv) Larger the value of pK_a weaker is the acid.

Select the correct code for above.

(A) TTTT (B) TFTT (C) FTFT (D) FTTT

D-2 (8) HA → NaA
10mm 10mm
b
HA + NaOH → NaA + H_2O
10m nm
– – 10+m 2mm nm

$pH = pK_a + \ln \frac{(10+b)}{(10-m)}$

(9) $CH_3COOH \rightarrow CH_3COONa$
1M 1M
$pH = pK_a + \log \frac{(150)}{(100)}$