CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

IONIC EQUILIBRIUM

B. properties of water and similar solvents

1. Which of the following expression is not true ?

A. $\left[H^{+}\right]=\left[OH^{-}\right]=\sqrt{K_{w}}$ for a neutral solution at all temperatures.

B. $\left[H^{+}\right]>\sqrt{K_{w}}$ and $\left[OH^{-}\right]<\sqrt{Kw}$ for an acidic solution

C. $\left[H^{+}\right] < \sqrt{K_w}$ and $\left[OH^{-}\right] > \sqrt{Kw}$ for an alkaline solution

D. $\left[H^{+}\right] = \left[OH^{-}\right] = 10^{-7}$ M for a neutral solution at all temperature.

Answer: d

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pH of strong acids and strong base

1. Which of the following solution will have a pH exactly equal to 8?

A. 10^{-8} M HCl solution at $25\,^{\circ}C$

B. 10^{-8} M H^{+} solution at $25^{\circ}C$

C. $2 \times 10^{-6} M Ba(OH)_2$ solution at $25^{\circ}C$

D. 10^{-5} M NaOH solution at $25^{\circ}C$

Answer: b

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D. pH of Polyprotic weak acids and weak bases

1. Determine K for the reaction :

$H_2C_2O_4(aq) + 2OH^{-}(aq) \rightarrow C_2O_4^{2-}(aq) + 2H_2O(l)$

$H_2C_2O_4(aq) K_{a_1} = 6.5 \times 10^{-2}, K_{a_2} = 6.1 \times 10^{-5}$

$H_2O K_w = 1.0 \times 10^{-14}$

A. 4.0×10^{-34}

B. 4.0×10^{-6}

C. 4.0×10^{6}

D. 4.0×10^{22}

Answer: d

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ph of weak acids, weake base, salt hydrolysis

1. What is the pH of a 0.15 M solution of formic acid, HCOOH ?

Formic Acid	K_a
$HCOOH$	1.9×10^{-4}

A. 1.49

B. 2.27

C. 3.72

D. 4.55

Answer: d

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F.pH of Buffer solutions

1. A solution of 0.1 M in CH_3COOH and 0.1 M in CH_3COONa .Which of the following will change its pH significantly ?

A. Addition of water

B. Addition of small amount of CH_3COONa without change in volume

C. Addition of small amount of CH_3COOH without change in volume

D. None will change the pH singnificantly

Answer: d

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Others

1. The following equilibrium is established when hydrogen chloride is dissolved in acetic acid $HCl(aq) + CH_3COOH(aq) \Leftrightarrow Cl^-(aq) + CH_3COOH_2^+(aq)$

The set that characterises the conjugate acid-base pairs is :

A. $\left(HCl, CH_3COOH\right)$ and $\left(CH_3COOH_2^+, Cl^-\right)$

B. $\left(HCl, CH_3COOH_2^+\right)$ and $\left(CH_3COOH, Cl^-\right)$

C. $\left(CH_2COOH_2^+, HCl\right)$ and $\left(Cl^-, CH_3COOH\right)$

D. $\left(HCl, Cl^-\right)$ and $\left(CH_3COOH_2^+, CH_3COOH\right)$

Answer: D

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2. In the following reaction $HC_2O_4^-(aq) + PO_4^{3-}(aq) \Leftrightarrow HPO_4^{2-}(aq) + C_2O_4^{2-}(aq)$, which are the two Bronsted bases ?

A. HC_2O^- and PO_4^{3-}

B. HPO_4^{2-} and $C_2O_4^{2-}$

C. $HC_2O_4^-$ and HPO_4^{2-}

D. PO_4^{3-} and $C_2O_4^{2-}$

Answer: D

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3. According to Bronsted Lowry concept, in given reaction, water will behave as :

$CH_3COOH + H_2O \Leftrightarrow CH_3COO^{\ominus} + H_3O^{\oplus}$

A. weak acid

B. weak base

C. strong acid

D. strong base

Answer: B

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4. Species acting as both Bronsted acid and base is:

A. HSO_4^-

B. Na_2CO_3

C. NH_3

D. OH^-

Answer: A

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5. The conjugate base of $H_2PO_4^-$ is :

A. PO_4^{3-}

B. P_2O_5

C. H_3PO_4

D. HPO_4^{2-}

Answer: D

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6. The conjugate base of OH^- is :

A. O_2

B. H_2O

C. O^-

D. O^{2-}

Answer: D

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7. Three reactions involving $H_2PO_4^-$ are given below :

(P)$H_3PO_4 + H_2O \rightarrow H_3O^+ + H_2PO_4^-$

(Q)$H_2PO_4^- + H_2O \rightarrow HPO_4^{2-} + H_3O^+$

(R) $H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{2-}$

In which of the above $H_2PO_4^-$ acts as an acid ?

A. Q only

B. P and Q

C. R only

D. P only

Answer: A

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8. Which of the following correctly explains the nature of boric acid in aqueous medium :

A. $H_3BO_3 \xrightarrow{H_2O} H_3O^+ + H_2BO_3^-$

B. $H_3BO_3 \xrightarrow{2H_2O} 2H_3O^+ + HBO_3^{2-}$

C. $H_3BO_3 \xrightarrow{3H_2O} 3H_3O^+ + BO_3^{3-}$

D. $H_3BO_3 \xrightarrow{H_2O} B(OH)_4^- + H +$

Answer: D

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9. In water, the acid $HCIO_4$, HCI, H_2SO_4 and HNO_3 exhibit the same strength as they are completely ionised in water (a base). This is called ...... of the solvent water.

A. Strength

B. Capacity

C. Buffer effect

D. Levelling effect

Answer: D

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10. The conjugate base of $\left[Al\left(H_2O\right)_3(OH)_3\right]$ is :

A. $\left[Al\left(H_2O\right)_3(OH)_2\right]^+$

B. $\left[Al\left(H_2O\right)_3(OH)_2O\right]^-$

C. $\left[Al\left(H_2O\right)_3(OH)_3\right]^-$

D. $\left[Al\left(H_2O\right)_2(OH)_4\right]^-$

Answer: D

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11. Which of the following is the strongest base ?

A. $C_2H_5^-$

B. $C_2H_5COO^-$

C. $C_2H_5O^-$

D. OH^-

Answer: A

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12. An acid with molecular formula $C_7H_6O_3$ froms only three types of sodium salts , i.e. $C_7H_5O_3$ Na, $C_7H_4O_3Na_2$ and $C_7H_3O_3Na_3$.The basicity of the acid :

A. One

B. Two

C. Three

D. Four

Answer: C

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13. Which of the following is a weak electrolyte in aqueous solution ?

A. HF

B. NaF

C. HCl

D. KCl

Answer: A

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14. $H_2CO_3(aq) + H_2O(l) \rightarrow HCO_3^{-(aq)} + H_3O^+(aq)$

$HCO_3^-(aq) + H_2O(l) \rightarrow CO_3^{2-}(aq) + H_3O^+(aq)$

Accoding to the equations above, what is the conjugate base of HCO_3^- ?

A. $H_2CO_3(aq)$

B. $H_2O(l)$

C. $H_3O^+(aq)$

D. $CO_3^{2-}(aq)$

Answer: D

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15. Weak acid include which of the following ?

(P)HF(aq) , (Q)HI(aq) , (R)$HNO_2(aq)$

A. P only

B. Q only

C. R only

D. P and R only

Answer: D

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16. Which is not a conjugate acid/base pair ?

A. H_2CO_3 and CO_3^{2-}

B. HSO_4^- and SO_4^{2-}

C. $H_2PO_4^-$ and HPO_4^{2-}

D. H_3O^+ and H_2O

Answer: A

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17. What is the conjugate base of HSO_4^- ?

A. H^+

B. H_2SO_4

C. OH^-

D. SO_4^{2-}

Answer: D

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18. When the acids, $HClO_3, H_3BO_3, H_3PO_4$, are arranged in order of increasing strength , which order is correct ?

A. $H_3BO_3 < H_3PO_4 < HClO_3$

B. $HClO_3 < H_3BO_3 < H_3PO_4$

C. $H_3PO_4 < HClO_3 < H_3BO_3$

D. $H_3BO_3 < HClO_3 < H_3PO_4$

Answer: A

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19. Which acid is the strongest ?

A. H_3BO_3

B. H_3PO_4

C. H_2SO_3

D. $HClO_3$

Answer: D

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20. What is the conjugate acid of HPO_4^{2-} ?

A. $H_3PO_4(aq)$

B. $H_2PO_4^{-}(aq)$

C. $H_3O^+(aq)$

D. $PO_4^{3-}(aq)$

Answer: B

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21. Which are strong acid ?

(P)$HClO_3$, (Q)H_2SeO_3 , (R)H_3AsO_4

A. P only

B. R only

C. P and R only

D. Q and R only

Answer: A

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22. Which are strong acids ?

(P)HI, (Q)HNO_3 , (R)H_2SO_3

A. Q only

B. P and Q only

C. Q and R only

D. P,Q and R

Answer: B

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23. Species acting as both Bronsted acid and base is:

A. HSO_4^-

B. Na_2CO_3

C. $H_2PO_2^-$

D. OH^-

Answer: A

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24. The dihydrogen phosphate ion undergoes these reaction in water

$H_2PO_4^-(aq) + H_2O(l) \rightarrow HPO_4^{2-}(aq) + H_3O^+(aq)K = 6.2 \times 10^{-8}$

$H_2PO_4^-(aq) + H_2O(l) \rightarrow H_3PO_4(aq) + OH^-(aq)K = 1.6 \times 10^{-7}$

What is the conjugate base of $H_2PO_4^-$?

A. $HPO_4^{2-}(aq)$

B. $H_2O(l)$

C. OH^- (aq)

D. H_3PO_4 (aq)

Answer: A

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25. Calculate the degree of ionization of pure water at $25^\circ C$.

A. 5.55×10^{-7}

B. 10^{-7}

C. 1.8×10^{-9}

D. 55.5×10^{-9}

Answer: c

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26. Hydrogen peroxide ionises as $H_2O_2 \Leftrightarrow H^+ + HO_2^-$ if pH of H_2O_2 is 5.7 at $25^\circ C$, the ionic product of H_2O_2 is :

A. 2×10^{-12}

B. 4×10^{-12}

C. 1×10^{-14}

D. 1.4×10^{-12}

Answer: b

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27. The pH of pure water at $50\,^{\circ}C$ is 6.63. What is the value of K_w at $50\,^{\circ}C$?

A. 1.8×10^{-15}

B. 1.0×10^{-14}

C. 5.5×10^{-14}

D. 2.2×10^{-13}

Answer: c

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28. At $20\,^{\circ}C$ water has $K_w = 6.807 \times 10^{-15}$.What is the pH of pure water at this temperature ?

A. 6.667

B. 6.920

C. 7.000

D. 7.084

Answer: d

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29. Which statement/relationship is correct ?

A. pH of 0.1 M $HNO_3, 0.1 M HCl, 0.1 M HI$ are not equal

B. $pH = -\log\frac{1}{[H^+]}$

C. At $25^\circ C$ the pH of pure water is 7

D. The value of pK_w at $25^\circ C$ is 7.

Answer: c

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30. Which of the following relations is correct ?

A. $\Delta G^{\circ} = RT \ln K_{eq}$

B. $\left[H_3O^+\right] = 10^{pH}$

C. $\log \frac{K_{w_2}}{K_{w_1}} = \frac{\Delta H^0}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

D. $\left[OH^-\right] = 10^{-7}$, for pure water at all temperature

Answer: c

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31. pOH of H_2O is 7.0 at $298K$. If water is heated at $350K$, which of the following statement should be true?

A. pOH will decrease

B. pOH will increase

C. pOH will remain 7.0

D. concentration of H^+ ions will increase but that of OH^- will decrease.

Answer: a

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32. Which of the following has the highest degree of ionisation ?

A. 1 M NH_3

B. $0.001 M NH_3$

C. $0.1 M NH_3$

D. $0.0001 M NH_3$

Answer: d

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33. One litre of water contains 10^{-7} mole H^+ ions. Degree of ionisation of water is:

A. $1.8 \times 10^{-7} \%$

B. $1.8 \times 10^{-9} \%$

C. $3.6 \times 10^{-9} \%$

D. $1.8 \times 10^{-11}\%$

Answer: b

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34. When rain is accompained by a thunderstorm, the collected rain water will have a pH:

A. Slightly lower than that of rain water without thunderstorm

B. sightly higher than that when the thunderstorm is not there

C. uninfluenced by occurrence of thunderstorm

D. which depends on the amount of dust in air

Answer: a

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35. For a weak electrolyte (HA) dissociation $\lim c \to 0$, then:

A. Electrolyte is assumed to be 100% ionised

B. its dissociation constant remains same

C. The interionic attractions diminishes to zero

D. All of these

Answer: d

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36. pH of water is 7.0 at $25^{\circ}C$. If water is heated to $70^{\circ}C$, the:

A. pH will decrease and solution becomes acidic

B. pH will increase

C. pH will remain constant as 7

D. pH will decrease but solution will be neutral

Answer: d

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37. For pure water:

A. pH increases and pOH decreases with rise in temperature

B. pH decreases and pOH increases with rise in temperature

C. Both pH and pOH increases with rise in temperature

D. Both pH and pOH decreases with rise in temperature

Answer: d

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38. At a temperature and under high pressure, $K_w\left(H_2O\right) = 10^{-10}$.A solution of pH 5.4 under those conditions is said to be :

A. acidic

B. basic

C. neutral

D. amphitonic

Answer: b

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39. Incorrect formula for Hydronium ion is :

A. H_3O^+

B. $H_9O_4^+$

C. $H_5O_2^+$

D. $H_4O_2^+$

Answer: d

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40. A sample of water has a hardness expressed as 80 ppm of Ca^{2+}.This sample is passed through an ion exchange column and the Ca^{2+} is replaced by H^{+} What is the pH of the water after it has been so treated ? [Atomic mass of Ca=40]

A. 3

B. 2.7

C. 5.4

D. 2.4

Answer: d

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41. A water sample from a municipal water supply was found to have a pH =7.0 On evaporting 2L of this water, 2.016 g of white solid was left behind in the evaporation vessel, i.e,. The Total Dissolved Solid (TDS) content of this water was 1008 mg L^{-1} However, addition of soap to a bucket of this water did not produce any visible scum.Based on these findings, one can conclude that :

A. there are no Ca^{2+} or Mg^{2+} ion in the water

B. there are no CO_3^{2-} or HCO_3^{-} ion in the water

C. concentration of any ion in the water is lower than 0.038 M

D. water may be containing Na^{+} ions in concentration gt

0.04 M

Answer: b

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42. If an aqueous solution at $25^{\circ}C$ has twice as many OH^{-} as pure water its pOH will be

A. 6.699

B. 7.307

C. 7

D. 6.98

Answer: a

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43. The dissociation of water at a certain temperature is 1.9×10^{-7} percent and the density of water is 1.0 g/cm^3.The ionization constant of water is :

A. 1.8×10^{-6}

B. 2×10^{-12}

C. 1.00×10^{-14}

D. 2.00×10^{-16}

Answer: b

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44. The pH of solution having $\left[OH^{-}\right] = 10^{-7}$ is

A. 14

B. 0

C. 8.2

D. 7.3

Answer: d

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45. At $900\,^{\circ}C$, pK_w is 13. At this temperature an aqueous solution with $pH = 7$ will be

A. acidic

B. basic

C. neutral

D. Unpredictable

Answer: b

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46. Specialised cells in the stomach release HCl to aid digestion.If they release much HCl, the excess can be neutralised by antacid tablets.Which of the following should be more effective active ingredient of antacid tablets ?

A. $Mg(OH)_2$

B. $Al(OH)_3$

C. $Ca(OH)_2$

D. H_2SO_4

Answer: b

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47. The $\left[OH^-\right]$ in 100.0 mL of 0.016 M-HCl(aq) is :

A. $5 \times 10^{12} M$

B. $3 \times 10^{-10} M$

C. $6.25 \times 10^{-13} M$

D. $2.0 \times 10^{-9} M$

Answer: c

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48. How many moles of $NaOH$ must be removed from 1 litre of aqueous solution to change its pH from 12 to 11

A. 0.009

B. 0.01

C. 0.02

D. 0.1

Answer: a

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49. Hydrogen ion concentration in mol/L in a solution of $pH = 5.4$ will be:

A. 3.98×10^{8}

B. 3.88×10^{6}

C. 3.68×10^{-6}

D. 3.98×10^{-6}

Answer: d

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50. Which solutionwill have pH closer to 1.0 ?

A. 100 mL of M/10 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

Answer: d

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51. 0.1 mol HCl is dissolved in distilled water of volume V, then, at $\lim V \rightarrow \infty (pH)_{\text{solution}}$ is equal to :

A. zero

B. 1

C. 7

D. 14

Answer: c

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52. The pH of a solution obtained by mixing 50 ml of 0.4 N HCl and 50 mL of 0.2 N NaOH is :

A. 13

B. 12

C. 1.0

D. 2.0

Answer: c

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53. At what molar concentration of HCl will its aqueous solution have an $\left[H^+\right]$ to which equal contribution comes from HCl and H_2O:

A. $\sqrt{60} \times 10^{-7}M$

B. $\sqrt{50} \times 10^{-8}M$

C. $\sqrt{40} \times 10^{-9}M$

D. $\sqrt{30} \times 10^{-8}M$

Answer: b

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54. The pH of the solution obtained by mixing 10 mL of $10^{-1}NHCI$ and 10 mL of $10^{-1}NNaOH$ is:

A. 8

B. 2

C. 7

D. none of these

Answer: c

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55. $10^{-6} MHCl$ is diluted to 100 times. Its pH is:

A. 6

B. 8

C. 6.95

D. 9.5

Answer: c

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56. What is the $\left[OH^{-}\right]$ in an aqueous solution which has a pH =11.70 ?

A. $7.1 \times 10^{-2}M$

B. $5.0 \times 10^{-3}M$

C. $1.4 \times 10^{-6}M$

D. $2.0 \times 10^{-12}M$

Answer: b

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57. What is the pH of a solution prepared by mixing 45.0 ml of 0.184 M KOH with 65.0 ml of 0.145 M HCl ?

A. 1.07

B. 1.13

C. 1.98

D. 2.92

Answer: c

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58. $10mL$ of $10^{-6}MHCl$ solution is mixed with $90mLH_2O$. pH will change approximately:

A. by one unit

B. by 0.3 unit

C. by 0.7 unit

D. by 0.1 unit

Answer: c

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59. $10mL$ of a strong acid solution of $pH = 2.000$ are mixed with $990mL$ of another strong acid solution of $pH = 4.000$. The pH of the resulting solution will be :

A. 4.002

B. 4.000

C. 4.200

D. 3.7

Answer: d

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60. pH of a solution made by mixing $200mL$ of $0.0657MNaOH$, $140mL$ of $0.107MHC1$ and $160mL$ of H_2O is

A. 3.04

B. 2.74

C. 2.43

D. 2.27

Answer: c

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61. An acid solution with $pH = 6 at 25^{\circ} C$ is diluted by 10^2 times. The pH of solution will:

A. decrease by 2

B. increase by 2

C. decrease by 0.95 approximately

D. increase by 0.95 approximately

Answer: d

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62. Number of H^+ ions present in 10 mL of solution of $pH = 3$ are:

A. 10^{13}

B. 6.02×10^{18}

C. 6.02×10^{13}

D. 6.02×10^{10}

Answer: b

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63. 100 mL of 1 M HCl is mixed with 50 ml of 2M HCl Hence , $\left[H_3O^+\right]$ is :

A. 1.00 M

B. 1.50 M

C. 1.33 M

D. 3.00 M

Answer: c

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64. 10^{-2} mole of $NaOH$ was added to $10 litres$ of water. The pH will change by

A. 4

B. 3

C. 11

D. 7

Answer: a

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65. What will be the effect of adding 100 mL of 10^{-3} M HCl solution to a solution of HA having concentration 0.1 M ? (K_a of HA=10^{-5})

A. Degree of dissociation of HA will decrease, pH will remain constant

B. Degree of dissociation of HA will increase and pH decreases

C. Neither pH nor degree of dissociation of HA will change .

D. Both degree of dissociation and pH will decrease

Answer: c

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66. The hydronium ion concentration in 5×10^{-4} M aqueous solution of NaOH at $25^{\circ} C$, is :

A. zero

B. $5 \times 10^{-4} M$

C. $2 \times 10^{-11} M$

D. $2 \times 10^{3} M$

Answer: c

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67. Three solutions of strong electrolytes 25 mL of 0.1 M HX, 25 mL of 0.1 M H_2 Y and 50 ml of 0.1 N Z $(OH)_2$ are mixed.What is the pOH of the solution ?

[Given log 5 = 0.7]

A. 1.6

B. 7

C. 11.6

D. 12.4

Answer: d

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68. What is the pH of a 0.0015 M solution of HNO_3 ?

A. 1.41

B. 2.82

C. 5.65

D. 11.18

Answer: b

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69. What is the pH of a 0.025 M solution of KOH ?

A. 1.60

B. 3.69

C. 10.31

D. 12.40

Answer: d

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70. A $50ml$ solution of $pH = 1$ is mixed with a $50ml$ solution of $pH = 2$. The pH of the mixture will be nearly

A. 0.86

B. 1.26

C. 1.76

D. 2.26

Answer: b

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71. Equal volumes of three acid solutions of $pH 3$, 4 and 5 are mixed in a vessel. What will be the H^+ ion concentration in the mixture?

A. $3.7 \times 10^{-3} M$

B. $1.11 \times 10^{-3} M$

C. $1.11 \times 10^{-4} M$

D. $3.7 \times 10^{-4} M$

Answer: d

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72. For ortho phosphoric acid,

$H_3PO_4(aq) + H_2O(aq) \rightarrow H_3O^+(aq) + H_2PO_4^-(aq), K_{a_1}$

$H_2PO_4^{-}{}^{(aq)} + H_2O(aq) \rightarrow H_3O^+(aq) + H_2PO_4^-(aq), K_{a_2}$

$HPO_4^{2-}(aq) + H_2O(aq) \rightarrow H_3O^+(aq) + PO_3^4(aq), K_{a_3}$

The correct order of K_a values is :

A. $K_{a_1} > K_{a_2} < K_{a_3}$

B. $K_{a_1} < K_{a_2} < K_{a_3}$

C. $K_{a_1} > K_{a_2} > K_{a_3}$

D. $K_{a_1} < K_{a_2} > K_{a_3}$

Answer: c

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73. Approximate pH of $0.01M$ aqueous H_2S solution, when K_1 and K_2 for H_2S at $25^\circ C$ are 1×10^{-7} and 1.3×10^{-13} respectively:

A. 4

B. 5

C. 6

D. 8

Answer: a

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74. The first and second dissociation constant of an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} repectively. The overall dissociation constant of the acid will be

A. 5.0×10^{-15}

B. 0.2×10^{5}

C. 5.0×10^{-5}

D. 5.0×10^{15}

Answer: a

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75. pK_{a_1} and pK_{a_2} of H_2SO_3 are 1.82 and 7.2 respectively. The pH after 20 mL of 0.16 M NaOH is added to 40 mL of 0.08 M H_2SO_3 is :

A. 7.0

B. 1.82

C. 8.8

D. 4.51

Answer: d

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76. In terms of K_1, K_2 and K_3 of a weak triprotic acid H_3B , the value of K_b for BH^{2-} will be :

A. $\frac{K_w}{K_1}$

B. $\frac{K_w}{K_2}$

C. $\frac{K_2}{K_w}$

D. $\frac{K_w}{K_3}$

Answer: b

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77. In aqueous solution the ionizatin constants for carbonic acid are :

$K_1 = 4.2 \times 10^{-7}$ and $K_2 = 4.8 \times 10^{-11}$

Select the correct statement for a saturated 0.034 M solution of the carbonic acid.

A. The concentration of CO_3^{2-} is 0.034 M

B. The concentration of CO_3^{2-} is greater than that of HCO_3^-

C. The concentration of H^+ and HCO_3^- are approximately equal

D. The concentration of H^+ is double that of CO_3^{2-}

Answer: c

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78. Calculate the pH of 6.66×10^{-3} M solution of $Al(OH)_3$, its first dissociation is 100% where as second dissociation is 50% and third dissociation is negligible.

A. 2

B. 12

C. 11

D. 3

Answer: b

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79. The K_a of phosphoric acid H_3PO_4 is 7.6×10^{-3} at $25\,^{\circ}C$

For the reaction , $H_3PO_4(aq) \rightarrow H_2PO_4^-(aq) + H^+(aq)$

ΔH° =-14.2 kJ/mol.What is the K_a of H_3PO_4 at $60\,^{\circ}C$?

A. 4.2×10^{-3}

B. 6.8×10^{-3}

C. 8.5×10^{-3}

D. 1.8×10^{-2}

Answer: a

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80. Calculate the hydronium ion concentration in 50.0 mL of 0.10 M NaH_2AsO_4. (

$K_1 = 6.0 \times 10^{-3}, K_2 = 1.1 \times 10^{-7}, K_3 = 3.0 \times 10^{-12}$)

A. 2.4×10^{-2}

B. 1.6×10^{-3}

C. 1.0×10^{-4}

D. 2.5×10^{-5}

Answer: d

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81. Carbonic acid , H_2CO_3 is a diprotic acid for which $K_1 = 4.2 \times 10^{-7}$ and $K_2 = 4.7 \times 10^{-11}$ Which solution will produce a pH closest to 9 ?

A. 0.1 M H_2CO_3

B. 0.1 M Na_2CO_3

C. 0.1 M $NaHCO_3$

D. 0.1 M $NaHCO_3$ and $0.1 M Na_2CO_3$

Answer: c

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82. The reverse process of neutralisation is :

A. hydrolysis

B. decomposition

C. dehydration

D. synthesis

Answer: a

Watch Video Solution

83. Consider an aqueous solution 0.1 M each in HOCN, HCOOH, $(COOH)_2$ and H_3PO_4 for HOCN, we can write $K_a(HOCN) = \frac{\left[H^+\right]\left[OCN^-\right]}{[HOCN]}$, $\left[H^+\right]$ in the expression refers to:

A. H^+ ions released by HOCN

B. Sum of H^+ ion released by all monoprotic acids

C. Sum of H^+ ions released by only the first dissociation of all the acids

D. Overall H^+ ion concentration in the solution

Answer: d

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84. The dissociation constant of acetic acid at a given temperature is 1.69×10^{-5}.The degree of dissociation of 0.01 M acetic acid in presence of 0.01 M HCl is equal to :

A. 0.41

B. 0.13

C. 1.69×10^{-3}

D. 0.013

Answer: c

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85. When 0.1 mole solid NaOH is added to 1 L of 0.01 M $NH_3(aq)$, then which statement is wrong ? ($K_b = 2 \times 10^{-5}$, log 2 =0.3)

A. Degree of dissociation of NH_3 approaches to zero

B. Change in pH by adding NaOH would be 1.85

C. In solution , $\left[Na^+\right]$ =0.1M , $\left[NH_3\right]$=0.1 M , $\left[OH^-\right]$ =0.2 M

D. on adding of OH^-, K_b of NH_3 does not change .

Answer: c

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86. At $25^{\circ} C, K_b$ for BOH=1.0×10^{-12}.0.01 M solution of BOH has $\left[OH^{-}\right]$:

A. $1.0 \times 10^{-6} M$

B. $1.0 \times 10^{-7} M$

C. $1.0 \times 10^{-5} M$

D. $2.0 \times 10^{-6} M$

Answer: b

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87. What is the degree of dissociation of weak acid HA (C=0.1 M) in presence of strong acid HB (C=0.1 M) ? Given :K_a=(weak acid)=10^{-6}

A. 10^{-5}

B. 10^{-6}

C. 10^{-4}

D. 10^{-3}

Answer: a

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88. A pair of salts are given in a solution each is 0.1 M in concentration. Which solution has a higher pH ?

A. NaCN and NaOBr

B. NaF and NaOCl

C. NaF and NaOBr

D. NaCN and NaOCl

Answer: a

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89. Which of the following salts undergoes anionic hydrolysis ?

A. $CuSO_4$

B. NH_4Cl

C. $AlCl_3$

D. K_2CO_3

Answer: d

Watch Video Solution

90. The sodium salt of a certain weak monobasic organic acid is hydrolysed to an extent of 3% in its 0.1 M solution at $25^\circ C$. Given that the ionic product of water is 10^{-14} at this temperature, what is the dissociation constant of the acid ?

A. $\approx 1 \times 10^{-10}$

B. $\approx 1 \times 10^{-9}$

C. 3.33×10^{-9}

D. 3.33×10^{-10}

Answer: a

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91. The pH of a solution obtained by mixing 100 mL of 0.2 M CH_3COOH with 100 mL of 0.2 M NaOH would be :(pK_a for CH_3COOH=4.74)

A. 4.74

B. 8.87

C. 9.10

D. 8.57

Answer: b

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92. pH of 0.1 M Na_2HPO_4 and 0.2 M NaH_2PO_4 are respectively : (pK_a for H_3PO_4 are 2.2,7.2,12.0)

A. 4.7,9.6

B. 9.6,4.7

C. 4.7,5.6

D. 5.6,4.7

Answer: b

Watch Video Solution

93. pH for the solution of salt undergoing anionic hydrolysis (say CH_3COONa) is given by:

A. $pH = \frac{1}{2}\left[pK_w + pK_a + \log C\right]$

B. $pH = \frac{1}{2}\left[pK_w + pK_a - \log C\right]$

C. $pH = \frac{1}{2}\left[pK_w + pK_b - \log C\right]$

D. none of the above

Answer: a

Watch Video Solution

94. The pH of $0.1M$ solution of the following salts decreases in the order

A. NaCN lt NH_4Cl lt NaCN lt HCl

B. HCl lt NH_4Cl lt NCl lt NaCN

C. NaCN lt NH_4Cl lt NaCl lt HCl

D. HCl lt NaCl lt NaCN lt NH_4Cl

Answer: b

Watch Video Solution

95. The correct relationship between the pH of isomolar solutions of sodium oxide $\left(pH_1\right)$, sodium sulphide $\left(pH_2\right)$, sodium selenide $\left(pH_3\right)$ and sodium telluride $\left(pH_4\right)$ is

A. $pH_1 > pH_2 > pH_3 > pH_4$

B. $pH_1 < pH_2 < pH_3 < pH_4$

C. $pH_1 < pH_2 < pH_3 = pH_4$

D. $pH_1 > pH_2 = pH_3 > pH_4$

Answer: a

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96. What would be the pH of an ammonia solution if that of an acetic acid solution of equal strength is 3.2? Assume dissociation constants for NH_3 and acetic acid are equal.

A. 3.2

B. 11.2

C. 9.6

D. 10.8

Answer: d

Watch Video Solution

97. The pH of which salt is independent of its concentration :

(P)$\left(CH_3COO\right)C_5H_5NH$, (Q)NaH_2PO_4 , (R)Na_2HPO_4, (S)

NH_4CN

A. P,Q,R and S

B. P and S

C. Q and R

D. P,Q and R

Answer: a

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98. The pH of a solution containing 0.1 M CH_3COONa and $0.1M\left(C_2H_5COO\right)_2$ Ba will be $K_a\left(CH_3COOH\right) = 2 \times 10^{-5}. K_a\left(C_2H_5COOH\right) = 1.5 \times 10^{-5}$:

A. 8.13

B. 9.13

C. 10.18

D. 11.18

Answer: b

Watch Video Solution

99. A weak acid HX has the dissociation constant $1 \times 10^{-5}M$. It forms a salt NaX on reaction with alkali. The percentage hydrolysis of $0.1M$ solution of NaX is

A. 0.0001%

B. 0.01%

C. 0.1%

D. 0.15%

Answer: b

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100. $2.5mL$ of $\frac{2}{5}$ weak monoacidic base ($K_b = 1 \times 10^{-12}$ at $25^\circ C$) is tittrated with $\frac{2}{15}MHCI$ in water at $25^\circ C$. The concentration of H^+ at equivalence point is: $\left(K_w = 1 \times 10^{-14} at 25^\circ C\right)$

A. $3.7 \times 10^{-14}M$

B. $3.2 \times 10^{-7}M$

C. $3.2 \times 10^{-2}M$

D. $2.7 \times 10^{-2}M$

Answer: d

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101. 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. 4.79

B. 7.01

C. 9.22

D. 9.58

Answer: b

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102. A 0.0200 M acid is 30% dissociated. The equilibrium constant K_a for the acid is :

A. 1.6×10^{-3}

B. 2.57×10^{-3}

C. 3.6×10^{-3}

D. 1.5×10^{-3}

Answer: b

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103. Calculate the change in pH when a 0.1 M solution of CH_3COOH in water at $25^{\circ}C$ is diluted to a final concentration of 0.01 M . $\left[K_a = 1.85 \times 10^{-5}\right]$

A. $+0.5$

B. $+0.4$

C. $+0.47$

D. $+0.6$

Answer: a

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104. 0.1 M CH_3COOH is diluted at $25^\circ C\left(K_a = 1.8 \times 10^{-5}\right)$, then which of the following will be correct ?

A. $\left[H^+\right]$ will increase

B. pH will increase

C. Number of H^+ may increases or decrease

D. All the above are correct

Answer: b

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105. The pK_a of iodic acid HIO_3 is log 9. Calculate the pH of a 1 M HIO_3 solution.

A. log 6

B. log 5

C. log 4

D. log 3

Answer: d

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106. The number of millimoles present per litre of solution of CH_3COONa so that 150 ppm (150 moles of its gets hydrolysed out of one million moles added) of if $K_a = 1.8 \times 10^{-5}$ is :

A. 25

B. 35

C. 45

D. 55

Answer: a

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107. pOH of 0.1 molar aqueous NaCN solution found to be 2, then calculate value of dissociation constant of HCN in its aqueous solution.

A. 1.11×10^{-3}

B. 10^{-2}

C. 10^{-11}

D. 9×10^{-12}

Answer: d

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108. What is the pH of a solution made by mixing 25.0 mL of 1.00×10^{-3} M HNO_3 and 25.0 mL of $1.00 \times 10^{-3} MNH_3$? $[K_b$

for $NH_3 = 1.8 \times 10^{-5}$]

A. 4.02

B. 6.28

C. 7.72

D. 9.98

Answer: b

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109. 0.1 M aqueous solution of $HClO_4, ZnCl_2$ and K_2S are taken , then increasing order of pH of solutions will be :

A. $K_2S < ZnCl_2 < HClO_4$

B. $K_2S < HClO_4 < ZnCl_2$

C. $HClO_4 < ZnCl_2 < K_2S$

D. $HClO_4 < K_2S < ZnCl_2$

Answer: c

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110. Ionisation constant of HA (weak acid) and BOH (weak base) are 3.0×10^{-7} each at 298 K. the percentage extent of hydrolysis of BA at the dilution of 10 L is :

A. 25

B. 50

C. 75

D. 40

Answer: a

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111. pH of the aq. Solution of 0.05 M $Ca(CN)_2$ at $25^\circ C$ is : [$pK_b\left(CN^-\right) = 8.26]$

A. 10.63

B. 9.37

C. 8.63

D. 8.37

Answer: b

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112. Alanine, $H_2NCH(CH_3)CO_2H,$ has $K_a = 4.5 \times 10^{-3}$ and $K_b = 7.4 \times 10^{-5}$ Which species has the highest concentration at a pH of 7.00 in H_2O?

A. $H_2NCH(CH_3)CO_2H$

B. . $^+H_3NCH(CH_3)CO_2H$

C. $H_2NCH(CH_3)CO_2^-$

D. . $^+H_3NCH(CH_3)CO_2^-$

Answer: c

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113. When 0.10 M solutions of HF, HCl, KF, and KCl are arranged in order of increasing pH which order is correc ?

A. HF, HCl,KF,KCl

B. HCl,HF,KF,KCl

C. HCl,HF,KCl,KF

D. HF,HCl,KCl,KF

Answer: c

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114. The K_a of hydrocyanic acid , HCN, is 5.0×10^{-10}.What is the pH of 0.050 M HCN(aq)?

A. Between 3.5 and 4.5

B. Between 5.0 and 5.5

C. Between 9.0 and 9.5

D. Between 10.5 and 11.0

Answer: b

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115. The concentraion of free HN_3 in a 0.01 M solution of KN_3 if $K_a = 1.9 \times 10^{-5}$ is :

A. 2.3 mol/mL

B. 3.3 mol/mL

C. 4.3 mol/mL

D. 5.3 mol/mL

Answer: a

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116. Both conc. Being 1 M, the factor by which the percent hydrolysis of CH_3COO^- is greater in CH_3COONH_4 than in CH_3COONa is :

$$\left[K_a\left(CH_3COOH\right) = K_b\left(NH_4OH\right) = 1.8 \times 10^{-5}\right]$$

A. 236

B. 136

C. 36

D. 3

Answer: a

Watch Video Solution

117. A 0.01 molar solution of hydrazinium iodide is found to be exactly 1 percent hydrolysed. The K_b of hydrazine is :

A. 10^{-5}

B. 10^{-6}

C. 10^{-7}

D. 10^{-8}

Answer: d

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118. An aqueous solution of CH_3COOH has a pH=3 and acid dissociation constant of CH_3COOH is 10^{-5} What will be the concentration of acid taken initially ?

A. 0.1 M

B. 0.11 M

C. 0.09 M

D. 0.101 M

Answer: d

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119. Which of the following pH is not possible for NH_4Cl solution at a temperature greater than $25^\circ C$?

A. 7

B. 5

C. 6.5

D. 4

Answer: a

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120. Assuming methanol to undergo self dissociation to give H^+ and CH_3O^- what will be its percentage dissociation if a 0.5 M solution has $\left[H^+\right]$ equal to $2.5 \times 10^{-4}M$?

A. $5\,\%$

B. $10\,\%$

C. $0.05\,\%$

D. $0.01\,\%$

Answer: c

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121. Which of the following combinations regarding True(T) and False (F) nature of following statement is correct ?

Statement-1: pH of water at any temperature will be 7.

Statement-2:Acid dissociation constant of water at 298 K is equal to 10^{-14}

Statement-3:For any aqueous acid solution (pH+pOH) will be equal to 14 at 298 K

Statement-4:Degree of dissociation of water at 308 K will be greater than $1.6 \times 10^{-7} \%$

Statement-5: On increasing dilution extent of dissociation of HCl will increase.

A. TFTTT

B. FTTFF

C. TTFFT

D. FFTTF

Answer: d

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122. The ratio of dissociation constant of two weak acids HA and HB is 4. At what molar concentration ratio, the two acids will have same pH ?

A. 2

B. 0.5

C. 4

D. 0.25

Answer: d

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123. The pK_a of acteylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about 2 - 3 and the pH in the small intestine is about 8. Aspirin will be:

A. unionised in the small intestine and in the stomach

B. completely ionised in the small intestine and in the stomach

C. ionised in the stomach and almost unisonised in the small intestine

D. ionised in the small intestine and almost unionised in the stomach.

Answer: d

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124. Fear or exitement, generally cause one to breathe rapidaly and it results in the decrease of concentration of CO_2 in blood. In what way it will change pH of blood ?

A. pH will increase

B. pH will decrease

C. No change

D. pH will be 7

Answer: a

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125. A certain weak acid has a dissociation constant 1.0×10^{-4}. The equilibrium constant for its reaction with a strong base is :

A. 1.0×10^{-4}

B. 1.0×10^{-10}

C. 1×10^{10}

D. 1.0×10^{-14}

Answer: c

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126. Calculate K for the reaction, $A^- + H_3\overset{+}{O} \Leftrightarrow HA + H_2O$

if K_a value for the acid HA is 1.0×10^{-6}.

A. 1×10^{-6}

B. 1×10^{12}

C. 1×10^{-12}

D. 1×10^{6}

Answer: d

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127. The degree of hydrrolysis of a salt of weak acid and weak base in its $0.1M$ solultion is found to be 50%. If the molarity of the solution is $0.2M$, the percentage hydrolysis of the salt should be:

A. $100\ \%$

B. $50\ \%$

C. $25\ \%$

D. None of these

Answer: b

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128. From separate solutions of sodium salts, NaW, NaX, NaY and NaZ have $pH 7.0$, 9.0, 10.0 and 11.0 respectively. When each solution was $0.1M$, the strongest acid is:

A. HW

B. HX

C. HY

D. HZ

Answer: a

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129. Percentange ionisation of weak acid can be calculated using the formula:

A. $100\frac{\sqrt{K_a}}{C}$

B. $\frac{100}{1 + 10^{\left(pK_a - pH\right)}}$

C. Both (a) and (b)

D. None of these

Answer: c

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130. Which of the following is true ?

A. pK_b for OH^- is -1.74 at $25^\circ C$

B. The equilibrium constant for the reaction between HA ($pK_a = 4$) and NaOH at $25^\circ C$ will be equal to 10^{10}

C. The pH of a solution containing 0.1 M HCOOH $\left(K_a = 1.8 \times 10^{-4}\right)$ and 0.1 M HOCN

D. All the above are correct

Answer: d

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131. If the equilibrium constant for the reaction of weak acid HA with strong base is 10^{9}, then pH of $0.1M$ Na A is:

A. 5

B. 9

C. 7

D. 8

Answer: b

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132. pH of $0.01MHS^-$ will be:

A. $pH = 7 + \frac{pK_a}{2} + \frac{\log C}{2}$

B. $pH = 7 - \frac{pK_a}{2} + \frac{\log C}{2}$

C. $pH = 7 + \frac{pK_1 + pK_2}{2}$

D. $pH = 7 + \left(\frac{pK_a + pK_b}{2}\right)$

Answer: a

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133. Solution of aniline hydrochloride is X due to hydrolysis of Y.X and Y are:

A. Basic , $C_6H_5NH_3^+$

B. Acidic , $C_6H_5NH_3^+$

C. Basic , Cl^-

D. Acidic , Cl^-

Answer: b

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134. At infinite dilution, the percentage dissociation of both weak acid and weak base is:

A. 1%

B. 20%

C. 50%

D. 100%

Answer: d

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135. The self ionisation constant for pure $HCOOH, K = \left[HCO\overset{\oplus}{O}H_2\right]\left[HCOO^{\ominus}\right]$ is 10^{-6} at room temperature. What percentage of $HCOOH$ molecules are converted to $HCOO^{\ominus}$ ions. The density of $HCOOH$ iws $1.22gcm^{-3}$.

A. $0.002\ \%$

B. $0.004\ \%$

C. $0.006\ \%$

D. $0.008\ \%$

Answer: b

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136. K_a for formic acid and acetic acid are 2.1×10^{-4} and 1.1×10^{-5} respectively. The relative strength of acids is:

A. $19:1$

B. $2.3:1$

C. $1:2.1$

D. $4.37:1$

Answer: d

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137. Which solution has the greatest percent ionization ?

A. $0.10 MNH_3\left(K_b = 1.8 \times 10^{-5}\right)$

B. $0.25 MHNO_2\left(K_a = 4.5 \times 10^{-4}\right)$

C. $1.00 MHCOOH\left(K_a = 1.7 \times 10^{-4}\right)$

D. $2.00 MCH_3NH_2\left(K_b = 4.4 \times 10^{-4}\right)$

Answer: b

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138. What is the pH of a 0.200 M solution of C_6H_5COONa?

(The K_a of C_6H_5COOH is 6.4×10^{-5})

A. 5.25

B. 5.40

C. 8.60

D. 8.75

Answer: d

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139. When 0.10 N solutions of ammonium acetate, barium acetate, and sodium acetate are ranked from basic to most basic, what is the correct order ?

A. $NH_4C_2H_3O_2 < NaC_2H_3O_2 < Ba\left(C_2H_3O_2\right)_2$

B. $Ba\left(C_2H_3O_2\right)_2 < NH_4C_2H_3O_2 < NaC_2H_3O_2$

C. $NaC_2H_3O_2 < Ba\left(C_2H_3O_2\right)_2 < NH_4C_2H_3O_2$

D. $NaC_2H_3O_2 < NH_4C_2H_3O_2 < Ba\left(C_2H_3O_2\right)_2$

Answer: a

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140. pH of 0.1 M NaA solution is :

Given : $\left(K_b\right)_{A^-} = 10^{-9}$

A. 5

B. 11

C. 9

D. 8

Answer: c

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141. 0.2 mol each of AgCl and NaCl are heated with conc. H_2SO_4 in presence of $K_2Cr_2O_7$ giving deep red vapours which are dissolved in 30 litre of water.What is pH of the resulting solution ?

[log 2=0.3, log 3=0.48]

Given : $\left(K_{a_2}\right)_{H_2CrO_4} = 10^{-7}$ Assume 100% first ionisation of H_2CrO_4

A. 1.18

B. 1.82

C. 2.18

D. 2

Answer: d

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142. pH of a weak monoacidic base is 12.What will be concentration of base $\left(K_b = 10^{-5}\right)$?

A. 10 M

B. 0.1 M

C. 0.01 M

D. 1 M

Answer: a

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143. pH increases if :

A. temperature of water increase

B. NH_4Cl is added to pure water

C. CH_3COONa is added to pure water

D. CH_3COOH is added to pure water

Answer: c

Watch Video Solution

144. The addition of 0.01 mol of which molecule has the lowest pH ?

A. NH_3

B. $HONH_2$

C. CH_3NH_2

D. H_2NNH_2

Answer: c

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145. A 1 M aqueous solution of which molecule has the lowest pH ?

A. HOCl

B. H_2SO_3

C. H_3PO_4

D. H_2SO_4

Answer: d

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146. A 0.015 M solution of a weak acid has a pH of 3.52 . What is the value of the K_a for this acid?

A. 2.0×10^{-2}

B. 6.2×10^{-6}

C. 9.1×10^{-8}

D. 1.4×10^{-9}

Answer: b

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147. Correct statements about the percentage ionization of weak acids in water include which of the following ?

(P)The percentage ionization increases as the ionization constant of the acid becomes larger.

(Q)the percentage ionization increases as the concentration of the acid becomes smaller.

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: c

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148. Calculate the percent ionization of $0.10M$ acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$.

A. $4.2\ \%$

B. $2.7\ \%$

C. $1.8\ \%$

D. $1.3\ \%$

Answer: d

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149. For which equation is the equilibrium constant equal to K_a for the ammonium ion, NH_4^+ ?

A. $NH_4^+(aq) + OH^-(aq) \Leftrightarrow NH_3(aq) + H_2O(l)$

B. $NH_4^+(aq) + H_2O(l) \Leftrightarrow NH_3(aq) + H_3O^+(aq)$

C. $NH_3(aq) + H_2O(l) \Leftrightarrow NH_4^+(aq) + OH^-(aq)$

D. $NH_3(aq) + H_3O^+(aq) \Leftrightarrow NH_4^+(aq) + H_2O(l)$

Answer: b

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150. A solution of $0.1MNaZ$ has $PH = 8.90$. The K_a of HZ is.

A. 1.6×10^{-4}

B. 1.6×10^{-5}

C. 6.3×10^{-10}

D. 6.3×10^{-11}

Answer: b

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151. A 0.1 M solution of which salt will have a pH less than 7 ?

A. NaCl

B. NH_4Br

C. KF

D. NaO_2CCH_3

Answer: b

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152. Which is the weakest acid ?

A. ascorbic acid $\left(K_a = 8.0 \times 10^{-5}\right)$

B. boric acid $\left(K_a = 5.8 \times 10^{-10}\right)$

C. butyric acid $\left(K_a = 1.5 \times 10^{-5}\right)$

D. hydrocyanic acid $\left(K_a = 4.9 \times 10^{-10}\right)$

Answer: d

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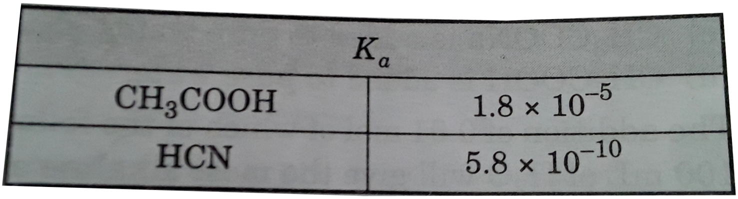
153. Which solution has the highest pH ?



	K_a
CH_3COOH	1.8×10^{-5}
HCN	5.8×10^{-10}

A. 0.10 M CH_3COOH

B. $0.10 M HCN$

C. $0.10 M CH_3COOK$

D. $0.10 M NaBr$

Answer: c

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154. A 0.050 M solution of an unknown acid is 1.0 % ionized .

What is the value of its K_b?

A. 2.5×10^{-7}

B. 5.0×10^{-6}

C. 5.0×10^{-4}

D. 5.0×10^{-2}

Answer: b

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155. Determine the equilibrium constant for the reaction :

$HF(aq) + NH_3(aq) \rightarrow NH_4^+(aq) + F^-(aq) K_a = 6.9 \times 10^{-4}$

$NH_3(aq) + H_2O(l) \rightarrow NH_4^+(aq) + OH^-(aq) K_b = 1.8 \times 10^{-5}$

$2H_2O(l) \rightarrow H_3O^+(aq) + OH^-(aq) K_w = 1.0 \times 10^{-14}$

A. 1.2×10^{-8}

B. 1.2×10^{6}

C. 8.1×10^{7}

D. 3.8×10^{15}

Answer: b

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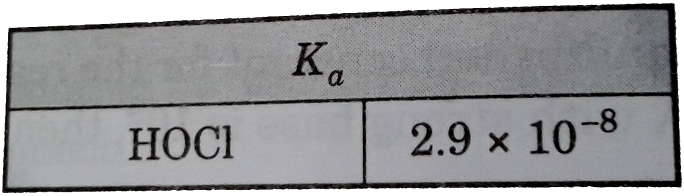
156. Calculate the pH of a 0.15 M solution of HOCl.



K_a	
HOCl	2.9×10^{-8}

A. 3.77

B. 4.18

C. 6.71

D. 8.36

Answer: b

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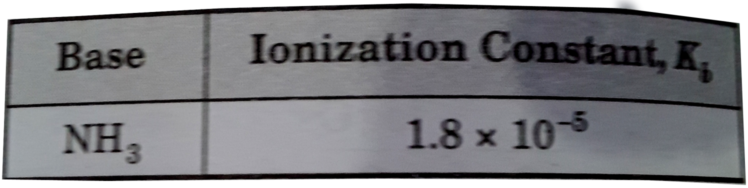
157. Calculate the concentration of hydrogen ion in mol/L of a 0.010 M solution of NH_4Cl



Base	Ionization Constant, K_b
NH_3	1.8×10^{-5}

A. 4.2×10^{-4}

B. 2.4×10^{-6}

C. 1.8×10^{-7}

D. 5.6×10^{-12}

Answer: b

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158. A 0.10 M solution of weak acid is 5.75% ionized. What is the K_a value for this acid ?

A. 3.3×10^{-3}

B. 3.3×10^{-4}

C. 4.2×10^{-5}

D. 3.3×10^{-5}

Answer: b

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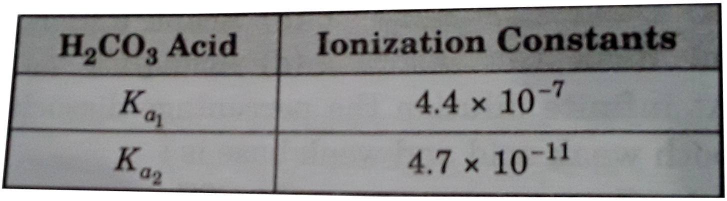
159. Calculate the pH of a 0.10 N solution of H_2CO_3



H_2CO_3 Acid	Ionization Constants
K_{a_1}	4.4×10^{-7}
K_{a_2}	4.7×10^{-11}

A. 3.68

B. 5.76

C. 7.36

D. 9.34

Answer: a

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160. Which weak acid has the strongest conjugate base ?

A. Acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$

B. Formic acid $\left(K_a = 1.8 \times 10^{-4}\right)$

C. Hydrofluoric acid $\left(K_a = 6.8 \times 10^{-4}\right)$

D. Propanoic acid $\left(K_a = 5.5 \times 10^{-5}\right)$

Answer: a

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161. What is the pH of a 0.010 M solution of a weak acid HA that is 4.0 % ionized ?

A. 0.60

B. 0.80

C. 2.80

D. 3.40

Answer: d

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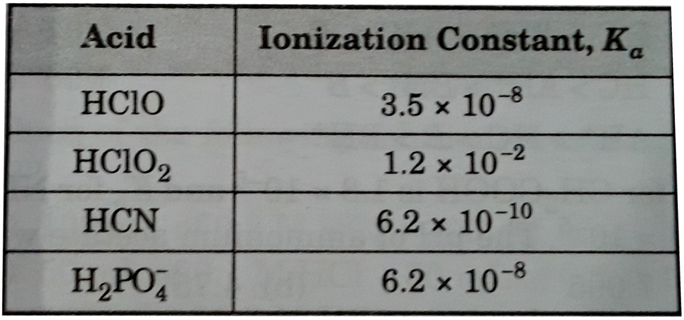
162. Given the acid ionization constants when the conjugate bases are arranged in order of increasing base strength , which order is correct ?



Acid	Ionization Constant, K_a
HClO	3.5×10^{-8}
$HClO_2$	1.2×10^{-2}
HCN	6.2×10^{-10}
$H_2PO_4^-$	6.2×10^{-8}

A. $CIO_2^-, CIO^-, HPO_4^{2-}, CN^-$

B. $CIO_2^-, HPO_4^{2-}, CIO^-, CN^-$

C. $CN^-, HPO_4^{2-}, ClO^-, ClO_2^-,$

D. $CN^-, ClO^-, HPO_4^{2-}, ClO_2^-$

Answer: b

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163. In a solution of formic acid $\left(K_a = 1.7 \times 10^{-4}\right)$, the $\left[H^+\right] = 2.3 \times 10^{-3}$.What is the concentration of formic acid in mol L^{-1}?

A. 7.2×10^{-2}

B. 3.1×10^{-2}

C. 5.3×10^{-6}

D. 3.9×10^{-7}

Answer: b

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164. A 0.010 M solution of a weak acid that produces one OH^- pe molecule of a 0.050 M solution is 2.5% ionized ?

A. 1.6×10^{-10}

B. 1.6×10^{-7}

C. 4.0×10^{-5}

D. 4.0×10^{-3}

Answer: b

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165. What is the K_b of a weak base that produces one OH^- per molecule if a 0.050 M solution is 2.5% ionized ?

A. 7.8×10^{-8}

B. 1.6×10^{-6}

C. 3.2×10^{-5}

D. 1.2×10^{-3}

Answer: c

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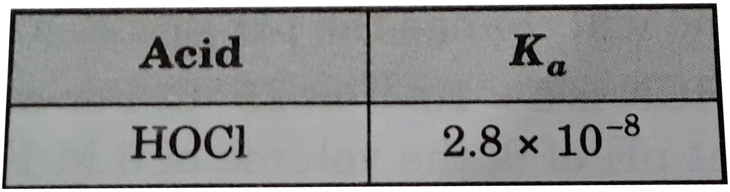
166. What is the $\left[OH^{-}\right]$ of a 0.65 M solution of NaOCl ?



Acid	K_a
HOCl	2.8×10^{-8}

A. $4.8 \times 10^{-4} M$

B. $1.3 \times 10^{-4} M$

C. $3.5 \times 10^{-7} M$

D. $2.1 \times 10^{-11} M$

Answer: a

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167. Acetylsalicylic acid (aspirin) behaves as an acid according to the equation shown.Calculate K_b for the $C_9H_7O_4^-$ (aq) ion :

$\left(K_a = 3.0 \times 10^{-4}\right)$

$HC_9H_7O_4(aq) + H_2O \Leftrightarrow H_3O^+(aq) + C_9H_7O_4^-(aq)$

A. 3.0×10^{-17}

B. 3.3×10^{-11}

C. 9.0×10^{-8}

D. 3.3×10^3

Answer: b

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168. Calculate the $\left[H^{+}\right]$ in a 0.25 M solution of methylamine, $CH_3NH_2\left(K_b = 4.4 \times 10^{-4}\right)$

A. 1.1×10^{-4}

B. 1.0×10^{-2}

C. 9.1×10^{-11}

D. 9.5×10^{-13}

Answer: d

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169. What is the $\left[H^{+}\right]$ in a solution in which $[HA] = 4.0 \times 10^{-2}$ and $\left[A^{-}\right] = 2.0 \times 10^{-2}$? $\left[K_a = 3.0 \times 10^{-6}\right]$

A. 1.5×10^{-6}

B. 3.0×10^{-6}

C. 6.0×10^{-6}

D. 3.8×10^{-3}

Answer: c

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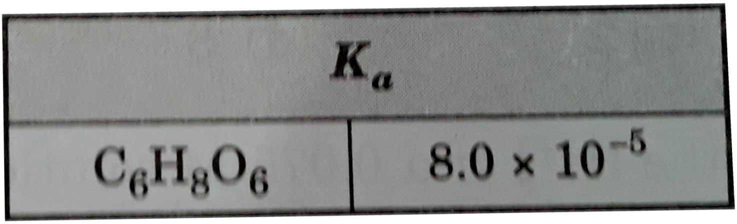
170. What is the $\left[H^{+}\right]$ in a 0.10 N solution of ascorbic acid, $C_6H_8O_6$?



K_a	
$C_6H_8O_6$	8.0×10^{-5}

A. $8.0 \times 10^{-6} M$

B. $2.8 \times 10^{-3} M$

C. $4.0 \times 10^{-3} M$

D. $5.3 \times 10^{-3} M$

Answer: b

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171. The degree of hydrolysis of 0.1 M solution of conjugate base of HA is 0.01.

Find the H^{+} concentation in 0.4 M solution of A^{-} :

A. $5 \times 10^{-11} M$

B. $5 \times 10^{-12} M$

C. $2 \times 10^{-3}M$

D. $2 \times 10^{-4}M$

Answer: b

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172. The hydrolysis of an ester was carried out with $0.1MH_2SO_4$ and $0.1NHCl$ separately. Which of the following expression between the rate constants is expected ? The rate expression being rate $= k\left[H^{\oplus}\right][\text{ester}]$

A. $K_{HCl} > K_{H_2SO_4}$

B. $K_{HCl} < K_{H_2SO_4}$

C. $K_{HCl} = K_{H_2SO_4}$

D. $K_{H_2SO_4} = K_{HCl}$

Answer: a

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173. Which salt gives the most acidic 0.1 M solution in water ?

A. NaCl

B. $NaNO_3$

C. NH_4Cl

D. NH_4NO_2

Answer: c

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174. A 0.1 M solution of which substances is most acidic ?

A. $NaHSO_4$

B. Na_2SO_4

C. $NaHS$

D. $NaHCO_3$

Answer: a

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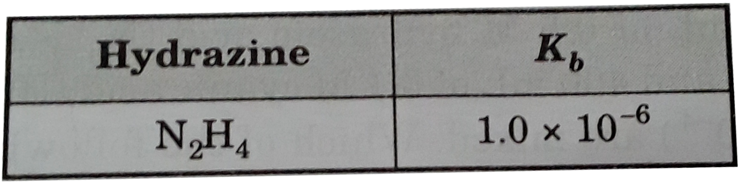
175. What is the pH of a 0.15 M solution of hydrazine , N_2H_4?



Hydrazine	K_b
N_2H_4	1.0×10^{-6}

A. 3.41

B. 6.82

C. 10.59

D. 11.00

Answer: c

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176. $HOCl(aq) \rightarrow H^{+}(aq) + OCl^{-}(aq)$

The ionization of hypochlorous acid represented above has $K = 3.0 \times 10^{-8}$ at $25\,^{\circ}C$ .What is K for this reaction ?

$Ocl^{-}(aq) + H_2O(l) \Leftrightarrow HOCl(aq) + OH^{-}(aq)$

A. 3.3×10^{-7}

B. 3.0×10^{-8}

C. 3.0×10^{6}

D. 3.3×10^{7}

Answer: a

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177. The ionization of benzoic acid is represented by this equation

$C_6H_5COOH(aq) \Leftrightarrow H^+(aq) + C_6H_5COO^-(aq)$

If a 0.045 M solution of benzoic acid has an $\left[H^+\right] = 1.7 \times 10^{-3}$, what is the K_a of benzoic acid ?

A. 7.7×10^{-5}

B. 6.4×10^{-5}

C. 3.8×10^{-2}

D. 8.4×10^{-1}

Answer: b

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178. pH when equal volume of 0.1 M HA $\left(K_a = 10^{-5}\right)$ and 1 M HB $\left(K_a = 10^{-6}\right)$ are mixed ?

A. 3+ log 2

B. 3-$\frac{1}{2}$ log 2

C. 3+$\frac{1}{2}$ log 2

D. 3

Answer: d

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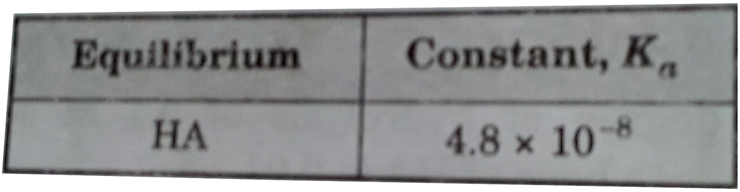
179. What is the $\left[H^{+}\right]$ of a 0.075 M solution of the acid HA ?



Equilibrium	Constant, K_a
HA	4.8×10^{-8}

A. $6.1 \times 10^{-4} M$

B. $2.2 \times 10^{-4} M$

C. $6.0 \times 10^{-5} M$

D. $4.8 \times 10^{-8} M$

Answer: c

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180. When a salt of weak acid and weak base is dissolved in water, the pH of the resulting solution will be :

A. 7

B. depends on the value of K_a and K_b

C. less than 7

D. greater than 7

Answer: B

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181. An aqueous solution of CH_3COOH has a pH=3 and acid dissociation constant of CH_3COOH is 10^{-5} What will be the concentration of acid taken initially ?

A. 0.1 M

B. 0.11 M

C. 0.09 M

D. 0.101 M

Answer: d

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182. What is the aq. Ammonia concentration of a solution prepared by dissolving 0.15 mole of $NH_4^+ CH_3COO^-$ in 1 L

H_2O ?

$$\left[K_a\left(CH_3COOH\right) = 1.8 \times 10^{-5} = K_b\left(NH_3\right)\right]$$

A. 8.3×10^{-4}

B. 0.15

C. 6.4×10^{-4}

D. 3.8×10^{-4}

Answer: a

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183. 100 mL of 0.5 M hydrazoic acid $\left(N_3H, K_a = 3.6 \times 10^{-4}\right)$ and 400 mL of 0.1 M cyanic acid $\left(HOCN, K_a = 8 \times 10^{-4}\right)$ are mixed .Which of the following is true for final solution ?

A. $\left[H^{+}\right] = 2 \times 10^{-2} M$

B. $\left[N^{3-}\right] = 3.6 \times 10^{-2} M$

C. $\left[OCN^{-}\right] = 4.571 \times 10^{-3} M$

D. $\left[OCN^{-}\right] = 6.4 \times 10^{-3} M$

Answer: d

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184. What is the $\left[HCOO^{-}\right]$ in the solution that contains 0.015 M HCOOH and 0.02 M HCl ?

$K_a(HCOOH) = 1.8 \times 10^{-4}$

A. 1.8×10^{-4}

B. 1.35×10^{-4}

C. 1.8×10^{-2}

D. 8×10^{-3}

Answer: b

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185. The position of equilibrium lies to right in each of following cases :

$AH^+ + B \Leftrightarrow A + BH^+ \quad \left(K_eq = 10^4\right)$

$B + HC \Leftrightarrow C^- + BH^+ \quad \left(K_eq = 10^6\right)$

$A + HC \Leftrightarrow C^- + AH^+ \quad \left(K_eq = 10^3\right)$

Based on this information, what is the order of acid strength ?

A. HC gt BH^+ gt AH^+ gt B

B. HC gt BH^+ gt AH^+ gt B

C. HC gt AH^+ gt BH^+ gt B

D. AH^+ gt HC gt B gt BH^+

Answer: c

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186. K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5} The pH of ammonium acetate will be :

A. 7.005

B. 4.75

C. 7.0

D. Between 6 and 7

Answer: c

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187. The correct order of increasing $\left[H_3O^+\right]$ in the following aqueous solution is :

A. $0.01 M H_2S < 0.01 M H_2SO_4 < 0.01 M NaCl < 0.01 M NaNO_2$

B. $0.01 M NaCl < 0.01 M NaNO_2 < 0.01 M H_2S < 0.01 M H_2SO_4$

C. $0.01 M NaNO_2 < 0.01 M NaCl < 0.01 M H_2S < 0.01 M H_2SO_4$

D. $0.01 M H_2S < 0.01 M NaNO_2 < 0.01 M NaCl < 0.01 M H_2SO_4$

Answer: c

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188. K_a for HCN is $5 \times 10 \wedge (- 10)$ at $25^{\circ} C$. For maintaining a constant pH of 9.0, the volume of $5MKCN$ solution required to be added to $10mL$ of $2MHCN$ solution is

A. 4 mL

B. 8 mL

C. 2 mL

D. 10 mL

Answer: c

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189. If $50ml$ of $0.2MKOH$ is added to $40ml$ of $0.5MHCOOH$, the pH of the resulting solution is $(K_a = 1.8 \times 10^{-4})$

A. 3.74

B. 5.64

C. 7.57

D. 3.42

Answer: a

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190. When 100 mL of 0.4 M CH_3COOH are mixed with 100 mL of 0.2 NaOH, the $\left[H_3O^+\right]$ in the solution is approximately : $\left[K_a\left(CH_3COOH\right) = 1.8 \times 10^{-5}\right]$

A. $1.8 \times 10^{-6}M$

B. $1.8 \times 10^{-5}M$

C. $9 \times 10^{-6} M$

D. $9 \times 10^{-5} M$

Answer: b

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191. What % of the carbon in the $H_2CO_3 - HCO_3^-$ buffer should be in the form of HCO_3^- so as to have a neutral solution? $\left(K_a = 4 \times 10^{-7}\right)$

A. 20 %

B. 40 %

C. 60 %

D. 80 %

Answer: d

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192. Which of the following solutions would have same pH ?

A. 100 mL of 0.2 M HCl + 100 mL of 0.4 M NH_3

B. 50 mL of 0.1 M HCl + 00 mL of 0.2 M NH_3

C. 100 mL of 0.3 M HCl + 100 mL of 0.6 M NH_3

D. All will have same pH

Answer: d

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193. Which of the following options is incorrect ?

A. pH at half equivalent point of a weak acid (HA) is equal to pK_b of its conjugate base.

B. An aqueous solution of sodium acetate will be basic due to anionic hydrolysis

C. pK_a for H_3O^+ at 298 K is -1.74

D. On dilution of a solution of a weak acid, degree of ionisation will increase but $\left[H^+\right]$ will decrease.

Answer: a

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194. The pK_a of HCN is 9.30. The pH of a solution prepared by mixing 2.5 moles of KCN and 2.5 moles of HCN in water and making up the total volume of 500 mL is :

A. 9.30

B. 7.30

C. 10.30

D. 8.30

Answer: a

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195. Pure water is added into the following solution causing a 10% increase in volume of each. The greatest percentage change in pH would be observed in which case (a),(b),(c), or (d) ?

A. 0.1 M $NaHCO_3$

B. 0.2 M NaOH

C. 0.3 M NH_3 - $0.2MNH_4^-$ system

D. 0.4 M CH_3COONH_4

Answer: b

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196. An equimolar solution of CH_3COOH and C_2H_5COONa will be :

A. acidic

B. neutral

C. alkaline

D. insufficient data to predict

Answer: a

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197. Aniline behaves as a weak base. When 0.1 M, 50 mL solution of aniline was mixed with 0.1 M , 25mL solution of HCl the pH of resulting solution was 8. The the pH of 0.01 M solution of anilinium chloride will be $\left(K_w = 10^{-14}\right)$

A. 6

B. 6.5

C. 5

D. 5.5

Answer: c

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198. Which one of the following mixtures creates a buffer solution ?

A. 10.0 mL 0.10 M NaOH+10.0 mL 0.10 M HF

B. 20.0 mL of 0.10 M NaOH +15.0 mL 0.10 M HF

C. 15.0 mL 0.10 M NaOH+20.0 mL 0.10 M HF

D. 10.0 mL 0.10 M NaOH+5.0 mL 0.20 M HF

Answer: c

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199. What is the pH of a 0.20 M HA solution $\left(K_a = 1.0 \times 10^{-6}\right)$ that contains 0.40 M NaA ?

A. 3.15

B. 3.35

C. 5.70

D. 6.30

Answer: d

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200. 0.1 mole of CH_3NH_2 $\left(K_b = 5 \times 10^{-4}\right)$ is mixed with 0.08 mole of HCl and diluted to 10 litre, what will be the OH^- concentration in the solution ?

A. $4.25 \times 10^{-4} M$

B. $1.25 \times 10^{-4} M$

C. $7.9 \times 10^{-4} M$

D. $2.5 \times 10^{-4} M$

Answer: b

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201. A 75 mL solution that is 0.10 M in $HC_2H_3O_2$ and 0.10 M in $NaC_2H_3O_2$ has a pH of 4.74.Which of the following actions will change the pH of this solution ?

(P)Adding 15 mL of 0.10 M HCl

(Q)Adding 0.010 mol of $NaC_2H_3O_2$

(R)Diluting the solution from 75 mL to 125 mL

A. P only

B. Q only

C. P and Q only

D. P,Q and R

Answer: c

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202. What happens when NH_4Cl is added to solution of NH_4OH ?

A. pH increases

B. pH decreases

C. pH remains same

D. pH may increase or decrease

Answer: b

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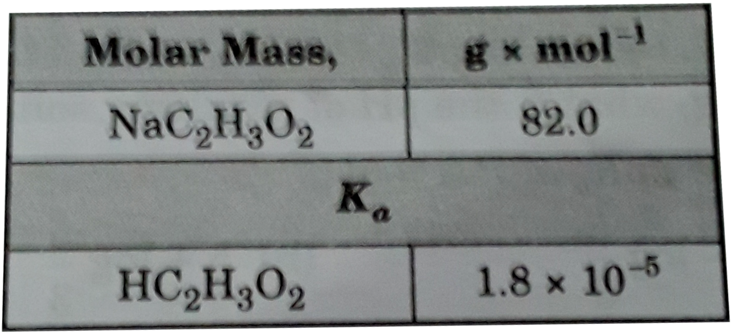
203. What is the pH of a solution made by adding 0.41 g of $NaC_2H_3O_2$ to 100 mL of 0.10 M $HC_2H_3O_2$?



Molar Mass,	$g \times mol^{-1}$
$NaC_2H_3O_2$	82.0
K_a	
$HC_2H_3O_2$	1.8×10^{-5}

A. 4.44

B. 4.70

C. 5.05

D. 8.95

Answer: a

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204. What will happen to the pH of a buffer solution when a small amount of a strong base is added ? The pH will :

A. increase slightly

B. decrease slightly

C. remain exactly the same

D. become 7.0

Answer: a

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205. Which mixtures form buffer solution ?

(P)100 mL of 0.200 M HF+200 mL of 0.200 M NaF

(Q) 200 mL of 0.200 M HCl+200 mL of 0.400 M CH_3CO_2Na

(R) 300 mL of 0.100 M CH_3CO_2H+100 mL of 0.300 M CH_3CO_2Na

A. P only

B. R only

C. Q and R only

D. P,Q and R

Answer: d

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206. Which of these mixtures constitute buffer solutions ?

Mixture 1 : 25 mL of 0.10 M HNO_3 and 25 mL of 0.010 M $NaNO_3$

Mixture 2: 25 mL of 0.10 M $HC_2H_3O_2$ and 25 mL of 0.10 M NaOH

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: d

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207. What happens to the pH of a buffer solution when it is diluted by a factor of 10 ?

A. The buffer pH decreases by 1 unit

B. The buffer pH increases by 1 unit

C. The change in pH depends on the buffer used

D. The pH does not change appreciably

Answer: d

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208. What is $\left[H_3O^+\right]$ in a solution formed by dissolving 1.00 g NH_4Cl (M=53.5) in 30 mL of 3.00 M NH_3 $\left(K_b = 1.8 \times 10^{-5}\right)$?

A. $2.7 \times 10^{-9}M$

B. $5.5 \times 10^{-10}M$

C. $1.2 \times 10^{-10}M$

D. $1.4 \times 10^{-12}M$

Answer: c

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209. What volumes of 0.200 M HNO_2 and 0.200 M $NaNO_2$ are required to make 500 mL of a buffer solution with pH =3.00 ?

$[K_a$ for $HNO_2 = 4.00 \times 10^{-4}]$

A. 250 mL of each

B. 143 mL of HNO_2 and 357 mL of $NaNO_2$

C. 200 mL of HNO_2 and 300 mL of $NaNO_2$

D. 357 mL of HNO_2 and 143 mL of $NaNO_2$

Answer: d

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210. 100 mL solution (I) of buffer containin 0.1 (M) HA and 0.2 (M)A^-, is mixed with another solution (II) of 100 mL containing 0.2 (M) HA and 0.3 (M) A^-. After mixing, what is the pH of resulting solution ?

[Given: pK_a of HA=5]

A. 5-log$\frac{5}{3}$

B. $5+\log\frac{5}{3}$

C. $5+\log\frac{2}{5}$

D. $5-\log\frac{5}{2}$

Answer: b

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211. What is the pH of 1.00 L sample of a buffer solution containing 0.10 mol of benzoic acid and 0.10 mol of sodium benzoate of which 0.010 mol of NaOH has been added ? $[K_a$ benzoic acid$=6.5\times10^{-5}]$

A. 4.27

B. 4.23

C. 4.15

D. 4.10

Answer: a

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212. Which pair of solutions forms a buffer solution when equal volumes of each are mixed ?

A. 0.20 M HCl and 0.20 M NaOH

B. 0.40 M $HC_2H_3O_2$ and 0.20 M NaOH

C. 0.20 M HCl and 0.20 M NH_3

D. 0.40 M HCl and 0.20 M NH_3

Answer: b

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213. A buffer solution made with NH_3 and NH_4Cl has a pH of 10.0 which procedure could be used to lower the pH ?

1.Adding HCl , 2.Adding NH_3 , 3. Adding NH_4Cl

A. 1 only

B. 2 only

C. 1 and 3 only

D. 2 and 3 only

Answer: c

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214. 1.0 L of an aqueous solution in which $\left[H_2CO_3\right] = \left[HCO_3^-\right] = 0.10M$, has $\left[H^-\right] = 4.2 \times 10^{-7}$.Which is the $\left[H^+\right]$ after 0.005 mole of NaOH has been added ?

A. $2.1 \times 10^{-9}M$

B. $2.2 \times 10^{-8}M$

C. $3.8 \times 10^{-7}M$

D. $4.6 \times 10^{-7}M$

Answer: c

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215. Which base is most suitable to prepare a buffer solution with a pH =11.00 ?

A. Ammonia $\left(K_b = 1.8 \times 10^{-5}\right)$

B. Aniline $\left(K_b = 4.0 \times 10^{-10}\right)$

C. Methylamine $\left(K_b = 4.4 \times 10^{-4}\right)$

D. Pyridine $\left(K_b = 1.7 \times 10^{-9}\right)$

Answer: c

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216. $HCOOH(aq) \Leftrightarrow H^{+}$(aq) $+HCOO^{-}$ (aq),$K_a = 1.7 \times 10^{-4}$

The ionization of formic acid is represented above.Calculate $\left[H^{+}\right]$ of a solution initially containing 0.10 M HCOOH and 0.050 M HCOONA :

A. $8.5 \times 10^{-5}M$

B. $3.4 \times 10^{-4} M$

C. $4.1 \times 10^{-3} M$

D. $1.8 \times 10^{-2} M$

Answer: b

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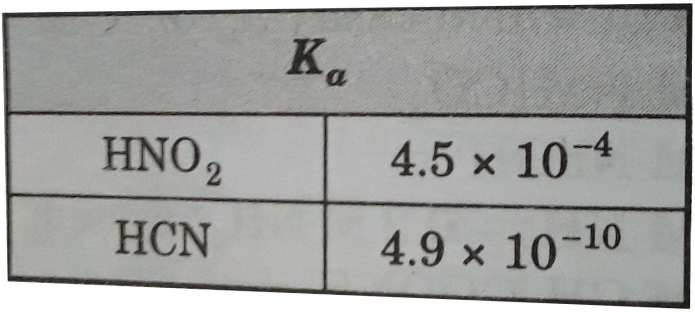
217. A student is asked to prepare a buffer solution with a pH of 4.00. This can be accomplished by using a solution containing which of the following ?



	K_a
HNO_2	4.5×10^{-4}
HCN	4.9×10^{-10}

A. HNO_2 only

B. HCN only

C. HNO_2 and $NaNO_2$

D. HCN and NaCN

Answer: c

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218. What is the pH of a solution that is 0.20 M in HF and 0.40 M in NaF ? $\left[K_a = 7.2 \times 10^{-4}\right]$

A. 1.92

B. 2.84

C. 3.14

D. 3.44

Answer: d

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219. 1 M benzoic acid $\left(pK_a = 4.20\right)$ and 1 M C_6H_5COONa solutions are given separately What is the volume of benzoic acid required to prepare a 300 ml buffer solution of pH =4.5 ? [log 2 =0.3]

A. 200 mL

B. 150 mL

C. 100 mL

D. 50 mL

Answer: c

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220. What is the difference in pH for $1/3$ and $2/3$ stages of neutralization of $0.1MCH_3COOH$ with $0.1MNaOH$?

A. 2 log 3

B. 2 log $\left(\frac{1}{4}\right)$

C. 2 log $\left(\frac{2}{3}\right)$

D. 2 log 2

Answer: d

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221. To prepare a buffer of pH 8.26, amount of $\left(NH_4\right)_2SO_4$ to be added into 500mL of $0.01MNH_4OH$ solution $\left[pK_a\left(NH_4^+\right) = 9.26\right]$ is:

A. 0.05 mole

B. 0.025

C. 0.10 mole

D. 0.005 mole

Answer: b

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222. How many moles of NaOCl must be added to 150 mL of 0.025 MHOCl to obtain a buffer solution with a pH

$= 7.50 ? \left[K_a(HOCl) = 2.8 \times 10^{-8}\right]$

A. 2×610^{-5}

B. 1.1×10^{-3}

C. 3.3×10^{-3}

D. 2.2×10^{-2}

Answer: c

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223. $1MNaCl$ and $1MHCl$ are present in an aqueous solution. The solution is

A. not a buffer solution with $pH < 7$

B. not a buffer solution with $pH > 7$

C. a buffer solution with $pH < 7$

D. a buffer solution with $pH > 7$

Answer: a

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224. 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. 9.5

B. 7.0

C. 4.5

D. 2.5

Answer: a

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225. A buffer solution contains 1 mole of $\left(NH_4\right)_2SO_4$ and 1 mole of $NH_4OH\left(K_b = 10^{-5}\right)$. The pH of solution will be:

A. 5

B. 9

C. 5.3

D. 8.7

Answer: d

Watch Video Solution

226. In which of the following combinations, is buffer action expected ?

1. $NH_3 + NH_4CI$, 2. $HCI + NaCI$

3. $NH_3 + HCIis2:1$ mole ration

Select the correct answer using the code given below:

A. 1 and 2

B. 1 and 3

C. 2 and 3

D. 1, 2 and 3

Answer: b

Watch Video Solution

227. Which solution is not a buffer solution ?

A. NaCN (2 mole) + HCl (1 mole) in 5 L

B. NaCN (1 mole) + HCl (1 mole) in 5 L

C. NH_3 (2 mole) + HCl (1 mole) in 5 L

D. CH_3COOH (2 mole) + KOH (1 mole) in 5 L

Answer: b

Watch Video Solution

228. Which species has the lowest concentration in a solution prepared mixing 0.1 mole each of HCN and NaCN in 1L solution ? $K_a(HCN) = 10^{-10}$

A. CN^-

B. HCN

C. H^+

D. OH^-

Answer: c

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229. Which may be added to one litre of water to act a buffer?

A. One mole of CH_3COOH and one mole of HCl

B. One mole of NH_4OH and one mole of NaOH

C. One mole of CH_3COOH and 0.5 mole of NaOH

D. One mole of CH_3COOH and 0.5 mole of NaOH

Answer: d

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230. 50 mL of 2N acetic acid mixed with 10 mL of 1N sodium acetate solution will have an approximate pH of $\left(K_a = 10^{-5}\right)$:

A. 4

B. 5

C. 6

D. 7

Answer: a

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231. The pH of an acidic buffer mixture is:

A. > 7

B. < 7

C. $= 7$

D. depends upon K_a of acid

Answer: d

Watch Video Solution

232. A certain buffer solution contains equal concentartion of X^{Θ} and HX. The K_b for X^{Θ} is 10^{-10}. The pH of the buffer is

A. 4

B. 7

C. 10

D. 14

Answer: a

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233. pH of a mixture containing $0.10 M X^-$ and $0.20 M HX$ is:

$\left[pK_b\left(X^-\right) = 4\right]$

A. 4+ log 2

B. 4- log 2

C. 10 + log 2

D. 10 - log 2

Answer: d

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234. The composition of an acidic buffer mixture made up of HA and NaA of total molarity 0.29 having $pH = 4.4$ and $K_a = 1.8 \times 10^{-5}$ in terms of concentration of salt and acid respectively is:

A. 0.09 M and 0.20 M

B. 0.20 M and 0.09

C. 0.1 M and 0.19 M

D. 0.19 M and 0.1 M

Answer: a

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235. Blood is buffered with CO_2 and HCO_3^-. What is the ratio of the base concentration to the acid (i.e., $CO_2(aq)$ plus $H_2CO_3\big)$ concentration to maintain the pH of blood at 7.4 ? The first dissociation constant of $H_2CO_3\left(H_2CO_3 \Leftrightarrow H^+ + HCO_3^-\right)$ is 4.2×10^{-7} where the H_2CO_3 is assumed to include $CO_2(aq)$ i.e., dissolved CO_2. [log 4.2=0.6232]

A. 10.6

B. 1.8

C. 180

D. 31

Answer: a

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236. To a solution of 20 mL of 0.1 M acetic acid, a solution of 0.1 M NaOH is added from burette. If 'r' is the ration of $\frac{[\text{salt}]}{[\text{acid}]}$, at what rate is the pH changing with respect to r when 5 mL of the alkali have been added ?

A. 3

B. $\frac{2.303}{3}$

C. $\frac{3}{2.303}$

D. $\frac{1}{3 \times 2.303}$

Answer: c

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237. In which of the following cases will neither pH nor pOH be less than 5 at 298 K ?

A. An aqueous solution of NaOH molarity $10^{-4}M$.

B. An aqueous solution of ammonium acetate.

C. An aqueous solution of NH_3 having concentration 0.1M and $K_b = 1.8 \times 10^{-5}$ for NH_3.

D. An aqueous solution of CH_3COOH having concentration 0.1 M and $K_b = \frac{10^{-9}}{1.8}$ for CH_3COO^- ion.

Answer: b

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238. 10 mL of 0.1 M-HCl solution is added in 90 mL of a buffer solution having 0.1 $M - NH_4OH$ and 0.1 $M - NH_4Cl$. The percentage change in pH of solution is $\left(K_a \text{ of } NH_4^+ = 5 \times 10^{-10}\right)$[log 2 = 0.3] :

A. $\frac{10}{4.7}$ % increase

B. $\frac{10}{4.7}$ % decrease

C. $\frac{10}{9.3}$ % increase

D. $\frac{10}{9.3}$ % decrease

Answer: d

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239. To the solution of a weak monobasic acid whose pH was 3, some amount of an HCl solution is added. This colud result into :

A. an increases in pH only

B. a decrease in pH only

C. either increase or decrease in pH

D. no change in pH only

Answer: c

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240. The volume of $0.1 M Na_2SO_4$ needed to be added to 10 mL of 0.1 M HCl to change the pH from 1.00 to 1.50 is :

$\left(K_2 = 1.26 \times 10^{-2} \text{ for } H_2SO_4\right)$

A. 6.6 mL

B. 4.4 mL

C. 2.2 mL

D. 1.1 mL

Answer: a

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241. 0.5 L of $0.5MCH_3COOH$ and 0.5 L of 0.25 M CH_3COONa are available. What maximum volume of a buffer with a pH =4.58 can be prepared using only these two resources ? $K_a = 1.8 \times 10^{-5}$

A. 0.85 L

B. 0.65 L

C. 0.45 L

D. 0.95 L

Answer: a

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242. Which of the following solution will exhibit the least change in pH on dilution to double their volumes ?

A. HCl solution

B. CH_3COOK - CH_3COOH solution

C. CH_3COONa solution

D. NH_4OH solution

Answer: b

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243. A solution containing $0.1 \text{ mole}/LHN_3$ and $0.2 \text{ mol } /LNaN_3$ has a pH =4.8. The K_a of HN_3 is :

A. 2×10^{-4}

B. 4×10^{-2}

C. 5×10^{-3}

D. 3×10^{-5}

Answer: d

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244. A buffer solution is made by mixing a weak acid HA $\left(K_a = 10^{-6}\right)$ with its salt NaA in equal amounts. What should be amount of acid or salt that should be added to make 90 mL of buffer solution in which if 0.1 mole of strong acid are added into 1 L of this buffer solution then change in pH is unity ?

A. 10 m moles

B. 22 m moles

C. 9 m moles

D. 11 m moles

Answer: d

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245. Determine the pOH of a solution after 0.1 mole of NaOH is added to 1 litre of solution containing 0.15 M CH_3COOH and 0.2 M CH_3COONa. Assume no change in volume.

[Given : log 3 =0.48, log 2 = 0.30, pK_a of acetic acid =4.74]

A. 8.48

B. 5.52

C. 9.66

D. None

Answer: a

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246. Buffer capacity of a buffer solution is x, the volume of $1MNaOH$ added to $100mL$ of this solution if the change of pH by 1 is

A. 0.1 x mL

B. 10 x mL

C. 100 x mL

D. x mL

Answer: c

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247. Which of the following salt solution may have pH=7 at $60^\circ C$?

A. NaCl

B. CH_3COONa

C. NH_4CI

D. K_2SO_4

Answer: b

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248. pH when solution containing HA $\left(K_a = 10^{-6}\right)$ and NaA show maximum buffer action will be :

A. 6

B. 7

C. < 6

D. > 7

Answer: a

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249. Which pair of solutes could be used to prepare an aqueous buffer solution with a pH < 7?

A. $HCI - NH_4CI$

B. $HF - NaF$

C. $NH_3 - NH_4CI$

D. $NaOH - NaCI$

Answer: b

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250. Which of the following will produce a buffer sollution when mixed in equal volumes ?

A. $0.1 \text{ mol dm}^{-3} NH_4OH$ and $0.1 \text{ mol dm}^{-3} HCI$

B. $0.05 \text{ mol dm}^{-3} NH_4OH$ and $0.1 \text{ mol dm}^{-3} HCI$

C. $0.1 \text{ mol dm}^{-3} NH_4OH$ and $0.05 \text{ mol dm}^{-3} HCI$

D. $0.1 \text{ mol dm }^{-3} CH_4COONa$ and $0.1 \text{ mol dm}^{-3} NaOH$

Answer: c

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251. Which of the following statement in incorrect ?

A. Acidic buffer solution must be acidic in nature.

B. Basic buffer solution can be of acidic, basic or neutral in nature.

C. A solution of salt of weak acid and weak base, acts as a buffer solution.

D. A solution in which $NaHCO_3$ and Na_2CO_3 are present, acts as a buffer solution.

Answer: a

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252. What volume of 0.2 M RNH_3CI solution should be added to 100 mL of 0.1 M RNH_2 solution to produce a buffer solution of pH=8.7 ?

[Given : pK_b of $RNH_2 = 5$, log 2=0.3]

A. 50 mL

B. 100 mL

C. 200 mL

D. None of these

Answer: b

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253. A certain indicator (an organic dye) has $pK_a = 5$. For which of the following titrations may it be suitable

A. Acetic acid against NaOH

B. Aniline hydrochloride against NaOH

C. Sodium carbonate against HCl

D. Barium hydroxide against oxalic acid

Answer: c

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254. The best indicator for detection of end point in titration of a weak acid and a strong base is

A. methyl orange (3 to 4)

B. methyl red (5 to 6)

C. bromothymol blue (6 to 7.5)

D. phenolphthalein (8 to 9.6)

Answer: d

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255. What fraction of an indicator $H\text{in}$ is in the basic form at a pH of 6 if pK_a of the indicator is 5?

A. $\frac{1}{2}$

B. $\frac{1}{11}$

C. $\frac{10}{11}$

D. $\frac{1}{10}$

Answer: c

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256. An acid-base indicator which is a weak acid has a pK_{In} value =5.45. At what concentration ratio of sodium acetate to acctic acid would the indicator show a colour half-way between those of its acid and conjugate base forms ?

$\left[pK_a\right.$ of acetic acid =4.75, log 2=0.3]

A. $4:1$

B. $6:1$

C. $5:1$

D. $3:1$

Answer: c

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257. Choose incorrect statement.

A. pH of a buffer solution increases from 4 to 5 on addition of 0.01 mole of NaOH in 1 litre. Buffer capactiy of solution is 0.01.

B. Phenolphathalein will be a suitable indicator for titration of weak acid with strong base.

C. Phenolphathalein, methyl orange are suitable indicator for titration of weak acid with base.

D. Solubility of electrolyte A_2B_3 is given as :

$$S = \left(\frac{K_{sp}\left(A_2B_3\right)}{108}\right)^{1/5}$$

Answer: c

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258. Which acid -base indicator will give the best results for the titration of an aqueous ammonia solution with 0.10 M HCl ?

Indicator	Colour Change	pH range
Methyl violet	*red* → *blue*	0 → 2
Methyl red	*red* → *yellow*	4 → 6
Cresol red	*yellow* → purple	7 → 9
Phenolphthalein	colourless → pink	8 → 10

A. Methyl violet

B. Methyl red

C. Cresol red

D. Phenolphthalein

Answer: b

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259. Phenolphalein does not act as an indicator for the titration between

A. HCl and NH_4OH

B. $Ba(OH)_2$ and HCl

C. NaOH and H_2SO_4

D. KOH and `CH_(3)COOH

Answer: a

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260. During the titration of a weak base with a strong acid, one should use an acid-base indicator that changes colour in the :

A. acidic range

B. basic range

C. buffer range

D. neutral range

Answer: a

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261. The amount of sodium hydrogen carbonate, $NaHCO_3$, in an antacid tablet is to be determined by dissolving the tablet in water and titrating the resulting solution with hydrochloric acid. Which indicator is the most appropriate for this titration ?

Acid	K_a
H_2CO_3	2.5×10^{-4}
HCO^{-3}	2.5×10^{-8}

A. methyl orange, $pK_{In} = 3.7$

B. bromothymol blue, $pK_{In} = 7.0$

C. phenolphthalein,$pK_{In} = 9.3$

D. alizarin yellow $pK_{In} = 12.5$

Answer: a

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262. To a $200ml$ of $0.1M$ weak aicd HA solution $90ml$ of $0.1M$ solution of $NaOH$ be added. Now, what volume of $0.1MNaOH$

be added into above solution so that pH of resulting solution be 5. $\left[K_a(HA) = 10^{-5}\right]$

A. 2 mL

B. 20 mL

C. 10 mL

D. 15 mL

Answer: c

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263. Determine the volume of 0.125 M NaOH required to titrate to the equivalence point 25.0 mL of a 0.175 M solution of a monoprotic weak acid that is 20 % ionized :

A. 7.00 mL

B. 17.9 mL

C. 28.0 mL

D. 35.0 mL

Answer: d

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264. A 50.0 mL sample of a 1.00 M solution of a diprotic acid $H_2A\left(K_{a1} = 1.0 \times 10^{-6} \text{ and } K_{a2} = 1.0 \times 10^{-10}\right)$ is titrated with 2.00 M NaOH. What is the minimum volume of 2.00 M NaOH needed to reach a pH of 10.00 ?

A. 12.5 mL

B. 37.5 mL

C. 25.0 mL

D. 50.0 mL

Answer: b

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265. What is the pH of the solution formed by mixing 25.0 mL of a 0.15 M solution of NH_3 with 25.0 mL of 0.12 M HCl ? $\left(K_b \text{ for } NH_3 = 1.8 \times 10^{-5}\right)$

A. 4.14

B. 5.34

C. 8.66

D. 9.86

Answer: c

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266. When 0.0030 mol of HCI is added to 100 mL of a 0.10 M solution of a weak base, R_2NH, the solution has a pH of 11.10. What is $1K_b$ for the weak base ?

A. 2.9×10^{-3}

B. 5.4×10^{-4}

C. 4.1×10^{-5}

D. 1.6×10^{-5}

Answer: b

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267. 50 mL of 0.1 M NaOH is added to 60 mL of 0.15 M H_3PO_4 solution

$\left(K_1, K_2\right.$ and K_3 for H_3PO_4 are $10^{-3}, 10^{-8}$ and 10^{-13} respectively). The pH of the mixture would be about (log 2=0.3) :

A. 3.1

B. 5.5

C. 4.1

D. 6.5

Answer: a

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268. $100mL$ of $0.02M$ benzoic acid $\left(pK_a = 4.2\right)$ is titrated using $0.02MNaOH$. pH values after $50mL$ and $100mL$ of $NaOH$ have been added are

A. 3.50, 7

B. 4.2,7

C. 4.2, 8.1

D. 4.2, 8.25

Answer: c

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269. What will be the pH at the equivalence point during the titration of a $100mL0.2M$ solution of $CH_3\mathbb{C}ONa$ with $0.2M$ solution of HCl? $K_a = 2 \times 10^{-5}$

A. $3 - \log \sqrt{2}$

B. $3 + \log \sqrt{2}$

C. 3- log 2

D. 3+ log 2

Answer: a

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270. 20 mL of a weak monobasic acid (HA) requires 20 mL 0.2 M NaOH for complete titration. If pH of solution upon addition of 10 mL of this alkali to 25 mL of the above solution of HA is 5.8, then pK_a of the weak acid is :

A. 6.1

B. 5.8

C. 5.98

D. 5.58

Answer: c

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271. The total number of different kind of buffers obtained during the titration of H_3PO_4 with $NaOH$ are:

A. 3

B. 1

C. 2

D. zero

Answer: a

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272. Strong acids are generally used as standard solution in acid-base titrations because:

A. The pH at equivalence point will be 7

B. They titrate both strong and weak base

C. They form more stable solutions than weak acids

D. The salts of strong acids do not hydrolyse

Answer: b

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273. A weak acid HA after teratment with 12 mL of $0.1M$ strong base BOH has a pH of 5. At the end point, the volume of same base required is $26.6mL$. K_a of acid is:

A. 1.8×10^{-5}

B. 8.22×10^{-6}

C. 1.8×10^{-6}

D. 8.2×10^{-5}

Answer: b

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274. A certain mixture of HCl and $CH_3 - COOH$ is $0.1M$ in each of the acids. $20ml$ of this solution is titrated against $0.1MNaOH$. By how many units does the pH change from the start to the stage when the HCl is almost completely neutralized and acidic acid remains unreacted? K_a for acetic acid $= 2 \times 10^{-5}$.

A. 1.5

B. 3

C. 2

D. 3.25

Answer: c

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275. 18 mL of mixture of acetic acid and sodium acetate required 6 mL of 0.1 M NaOH for neutralization of the acid and 12 mL of 0.1 M HCl for reaction with salt, separately. If pK_a of the acid is 4.75, what is the pH of the mixture ? [log 2=0.3]

A. 5.05

B. 4.75

C. 4.5

D. 4.6

Answer: a

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276. Equal volume of 0.02 M NH_3OH is mixed with 0.02 M HCl. Calculate $\left[NH_4OH\right]$ at equivalence point :

$K_b\left[NH_{4_{OH}}\right] = 10^{-5}$

A. $1.414 \times 10^{-3.5}$

B. $\dfrac{1.414}{3.16} \times 10^{-5}$

C. 3.16×10^{-5}

D. 3.16×10^{-6}

Answer: d

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277. If the initial pH values are the same for titrations of separate 25 mL samples of weak and strong monoprotic acids, which other value(s) is (are) also the same?

the pH at equivalence point

the volume of base needed to reach the eq.point.

A. P only

B. Q only

C. Both P and Q

D. Neither P and Q

Answer: d

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278. What is the pH after addition of 40 mL of 0.1 M NaOH in the titration of 50 mL of 0.1 M anilinium chloride ? $\left(K_a\right.$ for anilinicum ion $\left.= 2.5 \times 10^{-5}\right)$

A. 3

B. 4

C. 5

D. 6

Answer: b

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279. When a solution of $NH_3\left(K_b = 1.8 \times 10^{-5}\right)$ is titrated with a strong acid the indicator used should change colour near a pH of :

A. 1

B. 5

C. 9

D. 13

Answer: b

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280. 10 mL of 0.2 M HA is titrated with 0.2 M NaOH solution. Calculate change in pH between 50% of equivalence point to equivalence point.

$\left[K_a \text{ of HA } = 10^{-5}\right]$

A. 3.5

B. 2

C. 4

D. 3

Answer: c

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281. 10 mL of 0.1 M tribasic acid H_3A is titrated with 0.1 M NaOH solution. What is the ratio of $\frac{\left[H_3A\right]}{\left[A^{3-}\right]}$ at 2^{nd} equivalence point ?

Given $K_1 = 7.5 \times 10^{-4}, K_2 = 10^{-8}, K_3 = 10^{-12}$.

A. $\sim 10^{-4}$

B. $\sim 10^{+4}$

C. $\sim 10^{-7}$

D. $\sim 10^{+6}$

Answer: c

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282. Equal volumes of 0.25 M HNO_2 and 0.25 M HNO_3 are titrated separtely with 0.25 M KOH. Which would be the same for both titrations ?

A. Initial pH

B. pH halfway to the equivalence point

C. pH at the equivalence point.

D. pH when 5 mL excess KOH has been added

Answer: d

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283. pH when 100 mL of 0.1 M H_3PO_4 is titrated with 150 mL 0.1 m NaOH solution will be :

A. $pK_{a1} + \log 2$

B. $pK_{a2} + \log 2$

C. pK_{a2}

D. pK_{a1}

Answer: c

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284. A 0.052 M solution of benzoic acid, C_6H_5COOH, is titrated with a strong base. What is the $\left[H^+\right]$ of the solution one-half way to the equivalence point ?

Equilibrium	Constant, K_a
C_6H_5COOH	6.3×10^{-5}

A. $6.3 \times 10^{-5} M$

B. $1.8 \times 10^{-3} M$

C. $7.9 \times 10^{-3} M$

D. $2.6 \times 10^{-2} M$

Answer: a

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285. If the solubility of lithium sodium hexafluorido aluminate, $Li_3Na_3\left(AIF_6\right)_2$ is 's' " mol lt"^(-1)` , its solubility product is equal to :

A. $729s^8$

B. $12s^8$

C. $3900s^8$

D. $2916s^8$

Answer: d

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286. The solubility product $Mg(OH)_2$ in water at $25^\circ C$ is $2.56 \times 10^{-13}(\text{mol}/\text{lt})^3$ while that of $Al(OH)_3$ is

$4.32 \times 10^{-34}(\text{mol}/\text{lt})^4$. If s_1 and s_2 are the solubilities of $Mg(OH)_2$ and $Al(OH)_3$ in water in mol/lt at $25^\circ C$, what is the ratio, s_1/s_2 ?

A. 2×10^5

B. 2×10^4

C. 3×10^6

D. 3×10^3

Answer: b

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287. The solubility product of AgCl is 1.8×10^{-10}. Precipitation of AgCl will occur only when equal volumes of solutions of :

A. $10^{-4} M Ag^{+}$ and $10^{-4} M Cl^{-}$ are mixed

B. $10^{-7} M Ag^{+}$ and $10^{-7} M Cl^{-}$ are mixed

C. $10^{-5} M Ag^{+}$ and $10^{-5} M Cl^{-}$ are mixed

D. $2 \times 10^{-5} M Ag^{+}$ and $2 \times 10^{-5} M Cl^{-}$ are mixed

Answer: a

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288. In a saturated solution of Ag_2CO_3, silver ion concentration is 2×10^{-4} M. Its solubility product is :

A. 4×10^{-12}

B. 3.2×10^{-11}

C. 8×10^{-12}

D. 10^{-12}

Answer: a

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289. Slaked lime, $Ca(OH)_2$ is used extensively in sewage treatment. What is themaximum pH that can be estabilished in $Ca(OH)_2(aq)$?

$$Ca(OH)_{2(s)} \Leftrightarrow Ca_{(aq.)} + 2OH^-_{(aq.)}, \left(K_{SP} = 5.5 \times 10^{-6}\right)$$

A. 1.66

B. 12.35

C. 7.0

D. 14.0

Answer: b

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290. Out of the following salts identify the one which has maximum solubility (in M) :

(P) Barium sulphate having $K_{sp} = 1.1 \times 10^{-10}$

(Q) Aluminium phosphate having $K_{sp} = 6.3 \times 10^{-19}$

(R) Cadmium iodate having $K_{sp} = 3.2 \times 10^{-8}$

(S) Cuprous chloride having $K_{sp} = 1.2 \times 10^{-6}$

A. Aluminium phosphate

B. Cuprous chloride

C. Barium sulphate

D. Cadmium iodate

Answer: d

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291. K_{SP} of MX_4 and solubility of MX_4 is $Smol/L$ is related by:

A. $s = \left(\frac{K_{sp}}{128}\right)^{1/4}$

B. $s = \left(128K_{sp}\right)^{1/4}$

C. $s = \left(256K_{sp}\right)^{1/5}$

D. $s = \left(\frac{K_{sp}}{256}\right)^{1/5}$

Answer: d

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292. The solubility product of a salt having general formula MX_2 in water is 4×10^{-12}. The concentration of $M^{2+} ions$ in the aqueous solution of the salt is:

A. $2.0 \times 10^{-6} M$

B. $1.0 \times 10^{-4} M$

C. $1.6 \times 10^{-4} M$

D. $4.0 \times 10^{-10} M$

Answer: b

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293. A well is dry in a bed of rock containing fluorspar $\left(CaF_2\right)$. If the well contains $20, 000L$ of H_2O, what is the amount of

F^- in it

K_{SP} of $CaF_2 = 4 \times 10^{-11}$

A. 4.3 mol

B. 6.8 mol

C. 8.6 mol

D. 13.6 mol

Answer: c

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294. A solution is 0.10 M in Ag^+, Ca^{2+}, Mg^{2+} and Al^{3+} ions. Which compound will precipitate at the lowest $\left[PO_4^{3-}\right]$ when a solution of Na_3PO_4 is added ?

A. $Ag_3PO_4\left(K_{sp} = 1 \times 10^{-16}\right)$

B. $Ca_3\left(PO_4\right)_2\left(K_{sp} = 1 \times 10^{-33}\right)$

C. $Mg_3\left(PO_4\right)_2\left(K_{sp} = 1 \times 10^{-24}\right)$

D. $AlPO_4\left(K_{sp} = 1 \times 10^{-20}\right)$

Answer: d

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295. The solubility product of AgCl is 10^{-10}. The minimum volume (in L) of water required to dissolve 1.722 mg of AgCl (molecular weight of AgCl=143.5) :

A. 10 lt

B. 2.2 lt

C. 1.2 lt

D. 20 lt

Answer: c

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296. A solution is prepared by dissoving 2.8 g of lime (CaO) in enough water to make 1.00 L of lime water $\left(Ca(OH)_2(aq)\right)$. If solubility of $Ca(OH)_2$ in water is 1.48 gm/lt. The pH of the solution obtained will be : [log 2=0.3, Ca =40, O =16, H=1]

A. 12.3

B. 12.6

C. 1.3

D. 13

Answer: b

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297. 0.2 millimoes of Zn^{2+} ion is mixed with $\left(NH_4\right)_2$ S of molarity 0.02 M. The amount of Zn^{2+} that remains uprecipitated in 20 mL of this solution would be :

(Given : $K_{sp}(ZnS) = 4 \times 10^{-24}$)

A. $5.2 \times 10^{-22}g$

B. $2.6 \times 10^{-22}g$

C. $2 \times 10^{-23}g$

D. none of these

Answer: a

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298. K_{sp} of AgCl is 1.96×10^{-10}. 100 mL of saturated AgCl solution is titrated with $1 \times 10^{-5} MNH_4SCN$. Volume of $1 \times 10^{-5} MNH_4SCN$ required to precipitate all Ag^+ from saturated AgCl solution as AgSCN is :

A. 140 mL

B. 260 mL

C. 70 mL

D. 200 mL

Answer: a

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299. 0.1 millimole of $CdSO_4$ are present in 10 mL acid solution of $0.08NHCI$. Now H_2S is passed to precipitate all the Cd^{2+} ions. The pH of the solution after filtering off precipitate, boiling of H_2S and making the solution 100 mL by adding H_2O, is:

A. 2

B. 4

C. 6

D. 8

Answer: a

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300. The solubility product constant $\left(K_{sp}\right)$ of salts of types $MX, MX_2,$ and M_3X at temperature T are $4.0 \times 10^{-8}, 3.2 \times 10^{-14},$ and $2.7 \times 10^{-15},$ respectively. The solubilities of the salts at temperature T are in the order

A. $MX > MX_2 > M_3X$

B. $M_3X > MX_2 > MX$

C. $MX_2 > M_3X > MX$

D. $MX > M_3X > MX_2$

Answer: d

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301. For a sparingly soluble salt A_pB_q, the relationship of its solubility product $\left(L_s\right)$ with its solubility (S) is

A. $L_s = S^{p+q}. p^p. q^q$

B. $L_s = S^{p+q}. p^q. q^p$

C. L_s - $S^{pq}. p^p. q^q$

D. $L_s = S^{pq}. (pq)^{p+q}$

Answer: a

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302. The solubility of $Mg(OH)_2$ is S moles/litre. The solubility product under the same condition is :

A. $4S^3$

B. $3S^4$

C. $4S^2$

D. S^3

Answer: a

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303. The solubility of a springly soluble salt AB_2 in water is $1.0 \times 10^{-5} mol L^{-1}$. Its solubility product is:

A. 4×10^{-15}

B. 4×10^{-10}

C. 1×10^{-15}

D. 1×10^{-10}

Answer: a

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304. In a saturated solution of the spatingly soluble strong electrolyte $AgIO_3$ (molecular mass $= 283$) the equilibrium which sets in is

$AgIO_3(s) \Leftrightarrow Ag^+(aq) + IO_3^-(aq)$

If the solubility product constant K_{SP} of $AgIO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ cotained in $100mL$ of its saturated solution?

A. $1.0 \times 10^{-7}g$

B. $1.0 \times 10^{-4}g$

C. $28.3 \times 10^{-2} g$

D. $2.83 \times 10^{-3} g$

Answer: d

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305. Equal volumes of 1×10^{-4} M solutions of Cd^{2+} and CO_3^{2-} ions are mixed in one flask and equal volumes of 1×10^{-4} M solutions of Ag^{+} and CrO_4^{2-} ions are mixed in a second. Which substances precipitate ?

Formula	$CdCO_3$	Ag_2CrO_4
K_{sp}	5.2×10^{-12}	1.1×10^{-12}

A. $CdCO_3$ only

B. Ag_2CrO_4 only

C. Both

D. Neither

Answer: a

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306. When different types of salts have nearly same solubility product constant K_{SP} but less than one the most soluble salt is that:

A. which produces maximum number of ions

B. which produces minimum number of ions

C. which produces more charge on ion

D. none of the above

Answer: a

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307. Which of the following is most soluble in water ?

A. $MnS\left(K_{sp} = 8 \times 10^{-37}\right)$

B. $ZnS\left(K_{sp} = 7 \times 10^{-16}\right)$

C. $Bi_2S_3\left(K_{sp} = 5 \times 10^{-70}\right)$

D. $Ag_2S\left(K_{sp} = 6 \times 10^{-51}\right)$

Answer: b

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308. Ag^+ ion concentration in saturated solution of $Ag_3PO_4\left(K_{sp} = 2.7 \times 10^{-19}\right)$:

A. $10^{-5}M$

B. $2.7 \times 10^{-4}M$

C. $3 \times 10^{-5}M$

D. $10^{-4}M$

Answer: c

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309. The volume of the water needed to dissolve $1g$ of $BaSO_4\left(K_{SP} = 1.1 \times 10^{-10}\right)$ at $25^{\circ}C$ is:

A. 280 litre

B. 410 litre

C. 205 litre

D. 500 litre

Answer: b

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310. $M(OH)_X$ has $K_{SP} 4 \times 10^{-12}$ and solubility $10^{-4} M$. The value of x is:

A. 1

B. 2

C. 3

D. 4

Answer: b

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311. Which set is not correct for the solubility product $\left(K_{sp}\right)$, solubility ('s'g/litre) of sparingly soluble salt A_3B_2 (mol. Wt. M) in water :

(P) $K_{sp} = 108s^5$

(Q) $K_{sp} = \left[\frac{3s}{M}\right]^2\left[\frac{2s}{M}\right]^2$

(R) $K_{sp} = \left[1A^{2+}\right]^3\left[2B^{3-}\right]^2$

(S) $\left[B^{3-}\right] = \frac{2s}{M}$

(T) $\frac{\left[B^{3-}\right]}{K_{sp}} = \frac{1}{54}\frac{M^4}{s^4}$

A. P and R

B. P,R and T

C. Q,R and S

D. Q,S and T

Answer: a

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312. Select the correct statements : (P) pH of $NaHCO_3$ solution can be given by

$$\frac{pK_{H_2SO_4}+pK_{HCO_3^-}}{2}$$

(Q) Al^{3+} ion is amphoteric

(R) K_{sp} values of metal nitrate are very-very high

(S) Na^+ (aq) is conjugate acid of $NaOH$(aq).

A. P,Q,R and R

B. P,Q and S

C. Q,R and S

D. P,R and S

Answer: d

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313. Which of the following species is more soluble in water ?

A. $M(OH)_3 \ (k_{sp} = 1 \times 10^{-35})$

B. $M(OH)_2 \ \left(K_{sp} = 1 \times 10^{-30}\right)$

C. MOH $(K_{sp} = 1 \times 10^{-28})$

D. MOH $(K_{sp} = 1 \times 10^{-26})$

Answer: a

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314. A salt MX has $K_{sp} = 3.2 \times 10^{-11}$. Value of K_{sp} must another salt, KX_2, have, if the molar solubility of the two salts is to be identical?

A. 3.2×10^{-12}

B. 1.024×10^{-19}

C. 7.24×10^{-16}

D. 1.048×10^{-22}

Answer: c

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315. The solubility of $K_2Cr_2O_7$ in water is 125 g/L at 20° C. A solution is prepared at 20°C that contains 6.0 grame of $K_2Cr_2O_7$ in 50 mL of water. This solution is :

A. dilute

B. saturated

C. supersaturated

D. unsaturated

Answer: d

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316. Calculate the ratio of molar solubility of Metal(II)hydroxide to Metal (III) hydroxide at 25°C in pure H_2O :

Given : $\left(K_{sp}\right)_{M(OH)_2} = 2.7 \times 10^{-14}$

$\left(K_{sp}\right)_{M(OH)_3} = 2.7 \times 10^{-23}$

A. 1

B. 10

C. 1.5×10^{-10}

D. 1.5

Answer: b

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317. What is the solubility of $MgF_2\left(K_{sp} = 6.8 \times 10^{-9}\right)$ pure water?

A. $6.8 \times 10^{-9} molL^{-1}$

B. $5.8 \times 10^{-5} molL^{-1}$

C. $8.2 \times 10^{-5} molL^{-1}$

D. $1.2 \times 10^{-3} molL^{-1}$

Answer: d

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318. What will be the result when 15.0 mL of 0.040M lead(II) nitrate is mixed with 15.0 mL of 0.040M sodium chloride? $PbCl_2(s) \rightarrow Pb^{2+}(aq) + 2Cl^-(aq)\ [K_p = 1.7 \times 10^{-5}]$

A. A clear solution with no precipitate will result.

B. Solid $PbCl_2$ will precipitate and excess Pb^{2+} ions will remain in solution.

C. Solid $PbCl_2$ will precipitate and excess Cl^- ions will remain in solution

D. Solid $PbCl_2$ will precipitate and no excess ions will remain in solution.

Answer: a

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319. Calcium hydroxide is soluble in water with a K_{sp} of 1.3×10^{-6}. What is the pH of a saturated solution of calcium hydroxide at $25\,^{\circ}$ C?

A. 12.34

B. 12.14

C. 12.04

D. 11.84

Answer: b

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320. What is the $[OH^{-}]$ in a suspension of the antacid $Mg(OH)_2$? ($K_{sp} = 2.06 \times 10^{-13}$)

A. 7.4×10^{-5}M

B. 5.9×10^{-5}M

C. 4.7×10^{-5}M

D. 3.7×10^{-5}M

Answer: a

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321. The K_{sp} for $Al(OH)_3$ is 2.0×10^{-31}. What is the value of ΔG° for the precipitation of $Al(OH)_3$ of 25°C?

$Al^{3+}(aq) + 3OH^{-}(aq) \rightarrow Al(OH)_3(s)$

A. $-175KJmol^{-1}$

B. $-14.7KJmol^{-1}$

C. $14.7KJmol^{-1}$

D. $175KJmol^{-1}$

Answer: a

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322. A saturated solution of mangement(II) carbonate (M=114.95) contains 5.44×10^{-5}g of $MnCO_3$ per 100mL at 25° C. What is its K_{sp} at this temperature?

A. 4.7×10^{-6}

B. 3.0×10^{-9}

C. 2.2×10^{-11}

D. 2.2×10^{-13}

Answer: c

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323. A saturated solution of which salt will have the highest $\left[Ag^+\right]$?

A. $AgCl\left(K_{sp} = 1.8 \times 10^{-10}\right)$

B. $Ag_2CrO_4\left(K_{sp} = 1.1 \times 10^{-12}\right)$

C. $Ag_3PO_4\left(K_{sp} = 1.8 \times 10^{-18}\right)$

D. $Ag_2S\left(K_{sp} = 6.0 \times 10^{-51}\right)$

Answer: b

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324. What is the solubility in pure water of $Ba\left(IO_3\right)_2$ in moles per litre at 25°C?

$[K_{sp}\left(25^{\circ} C = 6.0 \times 10^{-10}\right]$

A. 1.2×10^{-5}

B. 1.7×10^{-5}

C. 5.3×10^{-4}

D. 8.4×10^{-4}

Answer: c

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325. Calculate the aqueous solubility of $Ca(OH)_2$ in grame per litre : $[K_{sp} = 8.0 \times 10^{-6}]$

A. 5.9×10^{-4}

B. 2.0×10^{-2}

C. 0.93

D. 1.5

Answer: c

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326. For the dissolution of Ag_2SO_4, $\Delta H^\circ = 17.8KJmol^{-1}$ and $\Delta S^\circ = -34.9Jmol^{-1}K^{-1}$ at $25^\circ C$, What is the value of the K_{sp} for Ag_2SO_4 at this temperature?

A. 5.0×10^{-2}

B. 7.6×10^{-4}

C. 5.3×10^{-4}

D. 1.1×10^{-5}

Answer: d

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327. For which salt is the molar solubility, s, is approximately equal to 4×10^{-6} M?

A. $AgC_2H_3O_2K_{sp} = 2 \times 10^{-3}$

B. $TIBrK_{sp} = 4 \times 10^{-6}$

C. $MnO_3K_{sp} = 2 \times 10^{-11}$

D. $Zn(OH)_2K_{sp} = 3 \times 10^{-17}$

Answer: c

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328. CaF_2 has a $K_{sp} = 3.9 \times 10^{-11}$ at 25° C. What is the $\left[F^-\right]$ in a saturated solution of CaF_2 at 25° C?

A. 2.1×10^{-4}

B. 3.4×10^{-4}

C. 4.3×10^{-4}

D. 6.8×10^{-4}

Answer: c

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329. The solubility of PbI_2 is $1.3 \times 10^{-3} molL^{-1}$. What is the K_{sp} for Pbl_2?

A. 2.2×10^{-9}

B. 8.8×10^{-9}

C. 1.7×10^{-6}

D. 3.4×10^{-8}

Answer: b

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330. Which saturated solution has the highest $[OH^-]$?

A. Aluminum hydroxide $(K_{sp} = 1.8 \times 10^{-32})$

B. Calcium hydroxide $(K_{sp} = 8.0 \times 10^{-6})$

C. Iron (II) hydroxide $\left(K_{sp} = 1.6 \times 10^{-14}\right)$

D. Magnesium hydroxide $(K_{sp} = 1.2 \times 10^{-11})$

Answer: b

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331. For the reaction :

$PbI_2(s) \rightarrow Pb^{2+}(aq) + 2I^-(aq)\ K_{sp} = 8.4 \times 10^{-9}$

What is the concentration of Pb^{2+} in mol/L in a saturated solution of PbI_2 in which $[I^-]$=0.01M?

A. 8.4×10^{-7}

B. 8.4×10^{-5}

C. 1.3×10^{-3}

D. 2.0×10^{-3}

Answer: b

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332. The K_{sp} of calcium flouride is 3.2×10^{-11}. Calculate the ΔG° (in $KJ. mol^{-1}$) for the dissolving of solid calcium fluoride at 25° C.

A. 2.18

B. 5.02

C. 26.0

D. 59.9

Answer: d

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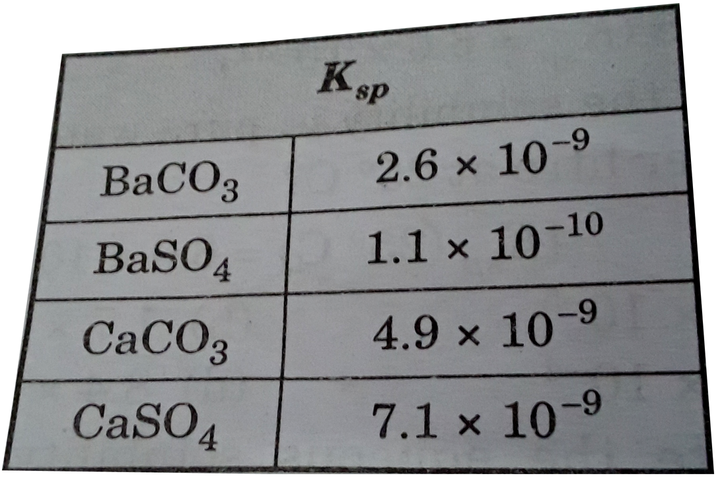
333. When the compounds below are arranged in order of increasing solubility in water, which order is correct?



	K_{sp}
$BaCO_3$	2.6×10^{-9}
$BaSO_4$	1.1×10^{-10}
$CaCO_3$	4.9×10^{-9}
$CaSO_4$	7.1×10^{-9}

A. $BaCO_3, BaSO_4, CaCO_3, CaSO_4$

B. $BaSO_4, CaCO_3, CaSO_4, BaCO_3$

C. $CaSO_4, CaCO_3, BaCO_3, BaSO_4$

D. $BaSO_4, BaCO_3, CaCO_3, CaSO_4$

Answer: d

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334. When solid silver chloride (MM=143.4) is added to 100mL of H_2O, 1.9×10^{-4} grams dissolves. What is the K_{sp} for silver chloride?

A. 1.3×10^{-5}

B. 3.7×10^{-6}

C. 3.7×10^{-8}

D. 1.8×10^{-10}

Answer: d

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335. A saturated solution of which compound has the lowest $\left[Ca^{2+}\right]$?

A. CaF_2

B. $CaCO_3$

C. $Ca(OH)_2$

D. $CaSO_4$

Answer: b

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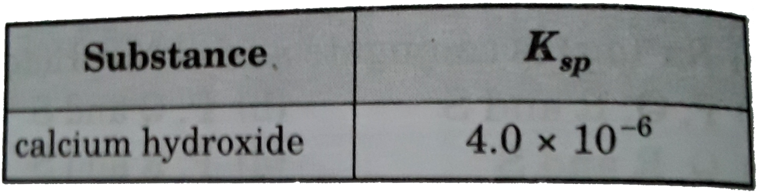
336. What is the solubility of calcium hydroxide in $mol.L^{-1}$?



Substance	K_{sp}
calcium hydroxide	4.0×10^{-6}

A. 1.6×10^{-2}

B. 1.0×10^{-2}

C. 2.0×10^{-3}

D. 1.0×10^{-3}

Answer: b

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337. If equal volumes of $BaCI_2$ and NaF solutions are mixed, which of these combination will not give a precipitate? $\left(K_{sp}ofBaF_2 = 1.7 \times 10^{-7}\right)$.

A. 0.0040M $BaCl_2$ and 0.020 M NaF

B. 0.010M $BaCl_2$ and 0.015 M NaF

C. 0.015M $BaCl_2$ and 0.010 M NaF

D. 0.020M $BaCl_2$ and 0.0020 M NaF

Answer: d

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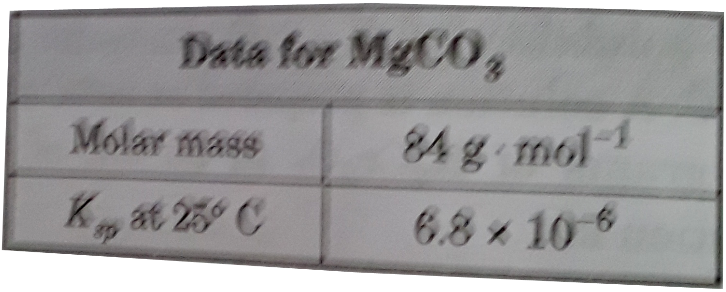
338. What is the solubility of magnesion carbonate, $MgCO_3$, in water at 25°C?



Data for $MgCO_3$	
Molar mass	$84\ g \cdot mol^{-1}$
K_{sp} at 25° C	6.8×10^{-6}

A. $0.22 g.L^{-1}$

B. $2.6 \times 10^{-3} g.L^{-1}$

C. $3.1 \times 10^{-5} g.L^{-1}$

D. $8.1 \times 10^{-8} g.L^{-1}$

Answer: a

Watch Video Solution

339. What is the pH of a saturated solution of magnesium hydroxide, $Mg(OH)_2$ at 25° C)

A. 10.56

B. 10.36

C. 10.26

D. 10.05

Answer: b

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340. Lead (II) fluoride $\left(PbF_2\right)$, lead(II) chloride $(PbCl_2$, lead(II) bromide $(PbBr_2)$ and lead (II) iodine $\left(PbI_2\right)$ are all slightly soluble in water. Which lead salt will increase in solubility when its saturated solution is acidified?

A. PbF_2

B. $PbCl_2$

C. $PbBr_2$

D. PbI_2

Answer: a

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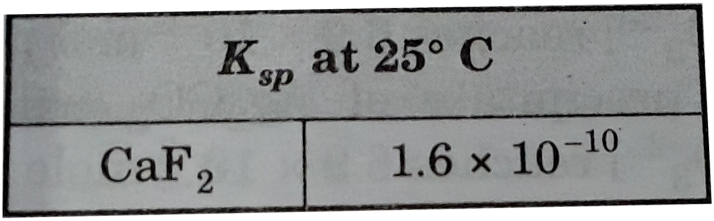
341. How many moles of calcium fluoride , CaF_2, must be dissolved in 2.0 L of water at $25^\circ C$ to form a saturated solution?



K_{sp} at 25° C	
CaF_2	1.6×10^{-10}

A. 2.6×10^{-2} mol

B. 1.3×10^{-3} mol

C. 6.8×10^{-4} mol

D. 3.4×10^{-4} mol

Answer: c

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342. The solubility products $\left(K_{sp}\right)$ of three salts MX, MY_2 and MZ_3 are $1 \times 10^{-8}, 4 \times 10^{=9}$ and 27×10^{-8}, respectively. The correct order for solubilities of these salts is :

A. $MX > MY_2 > MZ_3$

B. $MZ_3 > MY_2 > MX$

C. $MZ_3 > MX > MY_2$

D. $MY_2 > MX > MZ_3$

Answer: b

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343. A saturated solution of silver benzoate, $C_6H_5CO_2Ag$ has a pH of 8.63, K_a for benzoic acid is 6.5×10^{-5}. Estimate the value of K_{sp} of silver benzonate :

A. 1.49×10^{-3}

B. 1.399×10^{-2}

C. 1.287×10^{-2}

D. None of these

Answer: b

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344. A 500 mL saturated solution of $MgCO_3$ (M=84) is reduced to 120mL by evaporation. What mass of solid $MgCO_3$ is formed? $[K_{sp} = 4.0 \times 10^{-5}\}$

A. 0.013 g

B. 0.064 g

C. 0.20 g

D. 0.27g

Answer: c

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345. The solubility of CaF_2 $(K_{sp} = 3.4 \times 10^{-11})$ in 0.01 M solution of NaF would be:

A. 3.4×10^{-12} M

B. 3.4×10^{-9} M

C. 3.4×10^{-7} M

D. 3.4×10^{-13} M

Answer: c

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346. The solubility product of $BaCrO_4$ is $2.4 \times 10^{-10} M^2$. The maximum concentration of $Ba\left(N0_3\right)_2$ possible without precipitation in a 6×10^{-4} M K_2CrO_4 solution is :

A. 4×10^{-7} M

B. 1.2×10^{10} M

C. 6×10^{-4} M

D. 3×10^{-4} M

Answer: a

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347. What is the solubility of $Al(OH)_3$, $(K_{sp} = 10^{-33})$ in a buffer solution of pH=4?

A. 10^{-3}M

B. 10^{-6}M

C. 10^{-4}M

D. 10^{-10}M

Answer: a

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348. The solubility of $Fe(OH)_3$ would be maximum in :

A. 0.1 M NaOH

B. 0.1 M HCl

C. 0.1 M KOH

D. 0.1M H_2SO_4

Answer: d

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349. The best explanation for the solubility of MnS in dil. HCl is that:

A. Solubility product of $MnCl_2$ is less than that of MnS.

B. Concentration of Mn^{2+} is lowered by the formation of complex ions with chloride ions.

C. Concentration of sulphide ions is lowered by oxidation to free sulphur.

D. Concentration of sulphide ions is lowered by formation of week acid H_2S

Answer: d

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350. Which of the following statements is correct for a solution saturated with $AgCl$ and $AgBr$ if their solubilities in moles per litre in separate solutions are x and y respectively?

A. $\left[Ag^{+}\right]=x+y$

B. $\left[Ag^{+}\right]=\left[Br^{-}\right]+\left[Cl^{-}\right]$

C. $\left[Br^{-}\right] = y$

D. $\left[Cl^{-}\right] > x$

Answer: b

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351. At 25°, the solubility product values of AgCl and AgCNS are 1.8×10^{-10} and 1.6×10^{-11} respectively. When a solution is saturated with both solids, calculate the ratio $\frac{\left[Cl^{-}\right]}{\left[CNS^{-}\right]}$ and also $\left[Ag^{+}\right]$ in the solution.

A. $1.125, 4 \times 10^{-6}$M

B. $11.25, 1.4 \times 10^{-5}$M

C. $1.25, 4 \times 10^{-5}$M

D. $1.25, 4 \times 10^{-6}$M

Answer: b

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352. Arrange in increasing order of solubility of AgBr in the given solutions :

(i) 0.1 M NH_3 (iI) 0.1M $AgNO_3$

(iii) 0.2M NaBr (iv) pure water

A. $(iii) < (ii) < (iv) < (i)$

B. $(ii) < (iii) < (i) < (iv)$

C. $(iii) < (ii) < (i) < (iv)$

D. $(ii) < (iii) < (iv) < (i)$

Answer: a

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353. To precipitate as $Ag_2S(s)$, all Ag^+ present in 250mL of a saturated solution of $AgBrO_3$ requires 3.405 cm^3 of $H_2S(g)$ measured at STP (Assuming H_2S is enough soluble in water). K_{sp} of $AgBrO_3$ is :

$[K_{sp}\left(Ag_2S\right) = 10^{-50}, K_a\left(H_2S\right) = 10^{-21}]$.

A. 1.44×10^{-6}

B. 2.25×10^{-7}

C. 9×10^{-6}

D. 2.7×10^{-7}

Answer: a

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354. A solution is 10^{-3} M each in $Mn^{2+}, Fe^{2+}, Zn^{2+}$ and Hg^{2+} is treated with 10^{-16} M sulphide ion, If K_{sp} values of MnS, FeS, ZnS and HgS are $10^{-15}, 10^{-23}, 10^{-20}$ and 10^{-54} respectively, which one will precipitate first?

A. FeS

B. MgS

C. HgS

D. ZnS

Answer: c

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355. The salt $Al(OH)_3$ involved in the following two equilibria.

$$Al(OH)_3(s) \Leftrightarrow Al^{3+}(aq) + 3OH^-(aq), K_{sp}$$

$$Al(OH)_3(s) + OH^-(aq) \Leftrightarrow Al(OH)_4^-(aq), K_c$$

Which of the following relationship is CORRECT at which solubility is minimum?

A. $\left[OH^-\right] = \left(\frac{K_{sp}}{K_c}\right)^{1/3}$

B. $\left[OH^-\right] = \left(\frac{K_c}{K_{sp}}\right)^{1/3}$

C. $\left[OH^-\right] = \sqrt{\left(\frac{K_{sp}}{K_c}\right)^{1/4}}$

D. $\left[OH^-\right] = \left(\frac{3K_{sp}}{K_c}\right)^{1/4}$

Answer: d

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356. Solid $Ba(NO_3)_2$ is gradually dissolven in 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. 5.1×10^{-5} M

B. 8.1×10^{-9} M

C. 8.1×10^{-7} M

D. 4.1×10^{-5} M

Answer: a

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357. Solubility product of silver bromide is 5.0×10^{-13}. The quantity of potassium bromide (molar mass taken as $120 g mol^{-1}$) to be added to $1L$ of $0.05M$ solution of silver nitrate to start the precipitation of $AgBr$ is

A. 1.2×10^{-10} g

B. 1.2×10^{-9} g

C. 6.2×10^{-5} g

D. 5.0×10^{-8} g

Answer: b

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358. A solution is a mixture of 0.05 M NaCl and 0.05 M AgI. The concentration of iodide in the solution when AgCl just starts precipitating is equal to:

$$\left(K_{sp}AgCl = 1 \times 10^{-10}M^2, K_{sp}AgI = 4 \times 10^{-16}M^2\right)$$

A. 4×10^{-6} M

B. 2×10^{-8} M

C. 2×10^{-7} M

D. 8×10^{-15} M

Answer: c

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359. When pure water is saturated with $CaCO_3$ and CaC_2O_4 the concentration of calcium ion in the solution under equilibrium is 8×10^{-5} M. If the ratio of the solubility product of $CaCO_3$ to that of CaC_2O_4 is 3, what is the solubility of $CaCO_3$ in pure water?

A. 4.80×10^{-8}

B. 9.60×10^{-9}

C. 9.62×10^{-8}

D. 6.93×10^{-5}

Answer: d

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360. At $30^{\circ} C$ the solubility of $Ag_2CO_3 \left(K_{SP} = 8 \times 10^{-12}\right)$ would be gretest in one litre of:

A. 0.05M Na_2CO_3

B. 0.05M $AgNO_3$

C. pure water

D. 0.05M K_2CO_3

Answer: c

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361. The solubility products of $AI(OH)_3$ and $Zn(OH)_2$ are 8.5×10^{-23} and 1.8×10^{-14} respectively. If NH_4OH is added to a solution containing AI^{3+} and Zn^{2+} ions, then substance precipitated first is:

A. $Al(OH)_3$

B. $Zn(OH)_2$

C. both together

D. none at all

Answer: a

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362. The solubility of $PbCl_2$ in water is 0.01 M 25° C. Its maximum concentration in 0.1 M NaCl will be :

A. 2×10^{-3} M

B. 1×10^{-4} M

C. 1.6×10^{-2} M

D. 4×10^{-4} M

Answer: d

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363. A solution of Na_2CO_3 is added drop by drop to 1 litre of a solution containing 10^{-4} mole of Ba^{2+} and 10^{-5} mole of Ag^+, if K_{sp} for $BaCO_3$ is 8.1×10^{-9} and K_{sp} for $AgCO_3$ is 6.9×10^{-12} then which is not true?

A. No precipitate of $BaCO_3$ will appear untill $[CO_3^{2-}]$ reaches 8.1×10^{-5} mol per litre.

B. A precipitate of Ag_2CO_3 will appear when $\left[CO_3^{2-}\right]$ reaches 6.9×10^{-5} mol per litre.

C. No precipitate of Ag_2CO_3 will appear untill $\left[CO_3^{-2}\right]$ reaches 6.9×10^{-2} mole per litre.

D. $BaCO_3$ will be precipitate first.

Answer: b

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364. $Ca_3(PO_4)_2$ is insoluble in in water. On adding a few drops of HCl to solid $Ca_3(PO_4)_2$ in contant with water, the solid dissolves. The reason is:

A. The solvent becomes more polar on adding HCl

B. $Ca_3(PO_4)_2$ combines with HCl to form soluble $CaCl_2$ and H_3PO_4

C. $Ca(H_2PO_4)_2$ is formed, which dissolves

D. H_3PO_4 a weak acid is formed and the solubility product of $Ca_3(PO_4)_2$ decrease

Answer: b

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365. Silver nitrate solution is gradually added to an aqueous solution containing 0.01 M each of chloride, bromide and iodine ions. The correct sequence in which the halides will be precipitated is :

A. bromide, chloride, iodide

B. iodide, chloride, bromide

C. iodide, bromide chloride

D. bromide, Chloride

Answer: c

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366. The concentration of hydroxyl ion in a solution left after mixing 100 mL of 0.1 M $MgCl_2$ and 100 mL of 0.2 M NaOH:

(K_{sp} of $Mg(OH)_2 = 1.2 \times 10^{-11}$)

A. 2.88×10^{-3}

B. 2.88×10^{-2}

C. 2.88×10^{-4}

D. 2.88×10^{-5}

Answer: c

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367. K_{sp} of $Mg(OH)_2$ is $1 \times 10^{-12}.0.01$ M $MgCl_2$ will show precipitation is a solution of pH greater than :

A. 3

B. 9

C. 12

D. 8

Answer: b

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368. Which of the following statements is correct for a solution saturated with $AgCl$ and $AgBr$ if their solubilities in moles per litre in separate solutions are x and y respectively?

A. $\left[Ag^{+}\right] = \left[Br^{-}\right] \times \left[Cl^{-}\right]$

B. $\left[Cl^{-}\right] > [Br]$

C. $\left[Br^{-}\right] < y$

D. $\left[Ag^{+}\right] = x + y$

Answer: b

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369. The solubility produces of MA, MB, MC and MD are $1.8 \times 10^{-10}, 4 \times 10^{-3}, 4 \times 10^{-8}$ and 6×10^{-5} respectively. If a solution of MX is added dropwise to a mixure containing 0.01 M each of A^{-}, B^{-}, C^{-} and D^{-} ions, then the one which precipitates first will be :

A. MA

B. MB

C. MC

D. MD

Answer: a

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370. The solubility of Ag_2CO_3 in water at 25° is 1×10^{-4} mole /litre. What is its solubility in 0.01 M Na_2CO_3 solution? Assume no hydrolysis of CO_3^{2-} ion.

A. 6×10^{-6} mole/litre

B. 4×10^{-5} mole/litre

C. 10^{-5} mole/litre

D. 2×10^{-5} mole/litre

Answer: c

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371. The solubility product for SrF_2 is 7.9×10^{-11}. A solution is 0.01 M in NaF. The minimum concentration of $SrCl_2$ in the solution required to start the precipitation of SrF_2 is equal to :

A. 0.89×10^{-5}M

B. 0.79×10^{-6} M

C. 0.79×10^{-8} M

D. 0.89×10^{-7} M

Answer: b

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372. If the solubility of Ag_2SO_4 in $10^{-2} M Na_2SO_4$ solution be $2 \times 10^{-8} M$ then K_{sp} of Ag_2SO_4 will be

A. 32×10^{-24}

B. 16×10^{-18}

C. 32×10^{-18}

D. 16×10^{-24}

Answer: b

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373. Let the solubilities of $AgCl$ in pure water be $0.01 M CaCl_2$, $0.01 M NaCl$ and $0.05 M AgNO_3$ be s_1, s_2, s_3 and s_4 respectively. What is the correct order of these quantities? Neglect any complexation.

A. $s_1 > s_2 > s_3 > s_4$

B. $s_1 > s_2 = s_3 > s_4$

C. $s_1 > s_3 > s_2 > s_4$

D. $s_4 > s_2 > s_3 > s_1$

Answer: c

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374. The solubility product values of barium sulphate and barium carbonate 1.0×10^{-10} and 5.0×10^{-9} respectively. When these two salts are equilibriated in pure water then ratio of their solubilities is ,

A. 0.02

B. 0.1

C. 0.05

D. 0.12

Answer: a

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375. What is the minimum pH when $Fe(OH)_3$ starts precipitating from a solution containing 0.1 M $FeCl_2$? (K_{sp} of $Fe(OH)_3 = 8 \times 10^{-13} M^3$)

A. 3.7

B. 5.7

C. 10.3

D. 8.3

Answer: c

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376. What will be the solubility of $A(OH)_3$ in its aqueous solution if its solubility product is 2.7×10^{-39}?

A. $10^{-7}\frac{\text{moles}}{m^3}$

B. $2.7 \times 10^{-18}\frac{\text{moles}}{m^3}$

C. $2.7 \times 10^{-15}\frac{\text{moles}}{m^3}$

D. $10^{-10}\frac{\text{moles}}{m^3}$

Answer: c

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377. In which of the following solution, solubility of AgCl will be maximum?

A. 0.1 M $AgNO_3$

B. Water

C. 0.1 M -$NH_3(aq)$

D. 0.1 M NaCl

Answer: c

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378. Solubilty product of $Mg(OH)_2, Cd(OH)_2, Al(OH)_3$ and $Zn(OH)_2$ are $4 \times 10^{-11}, 8 \times 10^{-6}, 8.5 \times 10^{-23}$ and 1.8×10^{-14} resectively. The cation, that will precipitate first as hydroxide, on adding limited quantity of NH_4OH in a solution containing equimolar amount of metal cation, is :

A. Al^{3+}

B. Zn^{2+}

C. Mg^{2+}

D. Cd^{2+}

Answer: a

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379. In an aqueous solution 10^{-2} M Na_2SO_4 and 10^{-2} M NaI are present. Now pure $Pb\left(NO_3\right)_2$ is added gradually then calculate concentration of SO_4^{2-} when PbI_2 start precipitating in solution [$K_{sp}\left(PbI_2\right) = 10^{-9}$ and $K_{sp}\left(PbSO_4\right) = 10^{-8}$].

A. 10^{-2} M

B. 10^{-3} M

C. 10^{-6} M

D. 10^{-5} M

Answer: b

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380. An aqueous solution is 0.3 M in Al^{3+} and 3 M in Mg^{2+}.

Select the only incorrect option.

Given : $\left(K_{sp}\right)_{Al(OH)_3} = 3 \times 10^{-34}$, $\left(K_{sp}\right)_{Mg(OH)_2} = 3 \times 10^{-12}$,

A. At pH=9 both $Al(OH)_2$ and $Mg(OH)_2$ will precipitate

B. At pOH=12 nether $Al(OH)_3$ nor $Mg(OH)_2$ will precipitate

C. For selective precipitation of $Al(OH)_2$ only, pH of solution should be 3 to 8

D. $Mg(OH)_2$ will precipitate at maximum pH=8

Answer: d

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381. Copper(II) hydroxide, $Cu(OH)_2$ has $K_{sp} = 2.2 \times 10^{-20}$. For the reaction below, $K_{sp} = 4.0 \times 10^{-7}$. What is K_f for $Cu\left(NH_3\right)_4^{2+}$?

$Cu(OH)_2(s) + 4NH_3(aq) \Leftrightarrow Cu\left(NH_3\right)_4^{2+}(aq) + 2OH^-(aq)$

A. 8.8×10^{-27}

B. 5.5×10^{-14}

C. 1.8×10^{13}

D. 1.1×10^{26}

Answer: c

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382. What is maximum pH required to prevent the precipitation of ZnS in a solution that is 0.01 M $ZnCl_2$ and saturated with 0.10M H_2S?

[Given : $K_{sp}(ZnS) = 10^{-21}$,

$K_{a_1} \times K_{a_2}$ (of H_2S)=10^{-20}]

A. 0

B. 1

C. 2

D. 4

Answer: b

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383. Silver chloride, AgCl ($K_{sp} = 1.8 \times 10^{-10}$), can be dissolved in solution containing ammonia due to the formation of the soluble complex ion $Ag\left(NH_3\right)_2^+$. ($K_f = 1.0 \times 10^8$).

What is the minimum amount of NH_3 that would need to be added to dissolve 0.010 mol AgCl in 1.00L of solution?

A. 0.010 mol

B. 0.020 mol

C. 0.0945 mol

D. 0.13 mol

Answer: c

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384. At $25^{\circ}C$, the solubility product of $Mg(OH)_2$ is 1.0×10^{-11}. At which pH, will Mg^{2+} ions start precipitating in the form of $Mg(OH)_2$ from a solution of $0.001 M Mg^{2+}$ ions ?

A. 9

B. 10

C. 11

D. 8

Answer: b

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385. The solubility of $AgBrO_3$ in aqueous solution depends on the presence of other substances in solution. Relative to its solubility in H_2O the solubility of $AgBrO_3$ is higher in 0.10 M and lower in 0.10m M of :

A. $NH_3. KBrO_3$

B. $KBrO_3. NH_3$

C. $HNO_3. NH_3$

D. $NH_3. HNO_3$

Answer: a

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386. The pH of a saturated solution of $Fe(OH)_2$ is 8.67. What is the K_{sp} for $Fe(OH)_2$?

A. 5×10^{-6}

B. 2×10^{-11}

C. 1×10^{-16}

D. 5×10^{-17}

Answer: d

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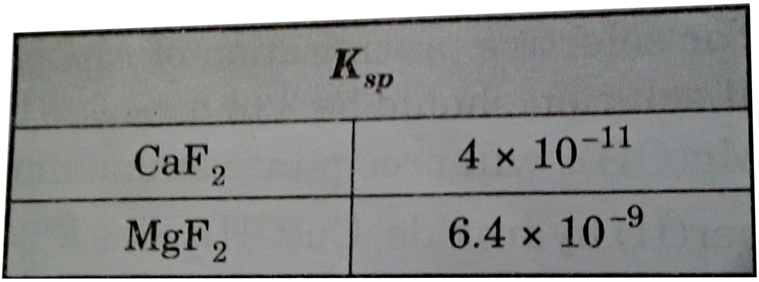
387. Which statement is correct about the initial precipitate that forms when a 0.10 M NaF solution is added slowly to a solution that is 0.10 M with respect to both $Ca(NO_3)_2$ and $Mg(NO_3)_2$?



	K_{sp}
CaF_2	4×10^{-11}
MgF_2	6.4×10^{-9}

A. The initial precipitate will contain CaF_2 only.

B. The initial precipitate will contain MgF_2 only.

C. The initial precipitate will contain both CaF_2 and MgF_2 with more CaF_2.

D. The initial precipitate will contain both CaF_2 and MgF_2 with more MgF_2.

Answer: a

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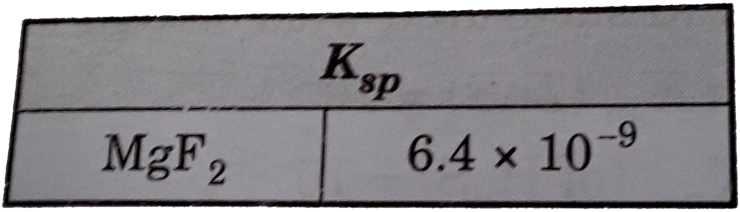
388. What is the $[Mg^{2+}]$ in 0.10 M NaF that is saturated with MgF_2 at 25° C ?



K_{sp}	
MgF_2	6.4×10^{-9}

A. 0.050 M

B. 1.9×10^{-3} M

C. 1.2×10^{-3} M

D. 6.4×10^{-7} M

Answer: d

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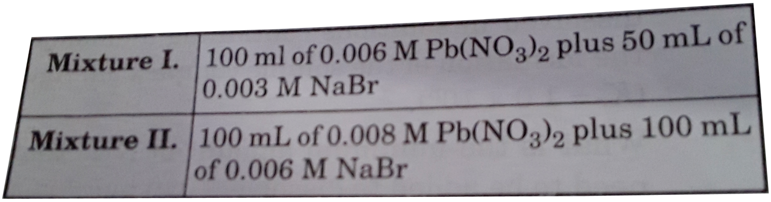
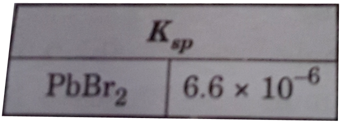
389. Consider these mixtures :



Mixture I.	100 ml of 0.006 M $Pb(NO_3)_2$ plus 50 mL of 0.003 M NaBr
Mixture II.	100 mL of 0.008 M $Pb(NO_3)_2$ plus 100 mL of 0.006 M NaBr



K_{sp}	
$PbBr_2$	6.6×10^{-6}

Which statement is correct?

A. A precipitate will not form in either mixture.

B. A precipitate will form only in mixture I.

C. A precipitate will form only in mixture II.

D. A precipitate will form in both mixtures.

Answer: a

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390. A solution of $Pb\left(NO_3\right)_2$ is added dropwise to a second solution in which $[Cl^-] = \left[F^-\right] = \left[I^-\right] = \left[SO_4^{2-}\right] = 0.001$ M. What is the first precipitate that forms?

A. $PbCl_2 \quad \left(K_{sp} = 1.5 \times 10^{-5}\right)$

B. $PbF_2 \quad \left(K_{sp} = 3.7 \times 10^{-8}\right)$

C. $PbI_2 \quad \left(K_{sp} = 8.5 \times 10^{-9}\right)$

D. $PbSO_4 \quad \left(K_{sp} = 1.8 \times 10^{-8}\right)$

Answer: d

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391. K_{sp} of AgCl,Ag_2CrO_4 and AgBr are 10^{-10}, 10^{-13} and 10^{-12} respectively. If to a solution of 0.1 M each of Cl^-, CrO_4^{2-} and

Br^- ions, $AgNO_3$ is added slowly, which will precipitate first :

A. AgCl

B. Ag_2CrO_4

C. AgBr

D. All simultaneously

Answer: c

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392. In which of the following solvents will $AgBr$ has highest solubility?

A. 10^{-3} M Nabr

B. 10^{-3} M NH_4OH

C. Pure water

D. 10^{-3} M HBr

Answer: b

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393. Solubility of Ag_2CrO_4 $(K_{sp} = 4 \times 10^{-13})$ in 0.1 M K_2CrO_4 solution will be :

A. 10^{-3} M

B. 10^{-6} M

C. 4×10^{6} M

D. 5×10^{-7} M

Answer: b

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394. A solution containing 10^{-2} M $MgCl_2$ will just form precipitate when pH in the solution is :

$K_{sp}\left(Mg(OH)_2\right) = 10^{-12}$

A. 5

B. 6

C. 9

D. 10

Answer: c

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395. 1 mole of $AgNO_3$ is added to 10 litre of 1 M NH_3. What is the concentration of $Ag\left(NH_3\right)^+$ in solution? [Given : For $Ag\left(NH_3\right)_2^+$, $K_{f_1} = 2.0 \times 10^3$, $K_{f_2} = 10^3$]

A. 8×10^{-5}

B. 1.25×10^{-5}

C. 4×10^{-5}

D. 1.25×10^{-5}

Answer: b

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396. What is the pH of a saturated solution of milk of magnesia, $Mg(OH)_2$ if the K_{sp} of this compound is 4×10^{-12}?

A. 3.5

B. 9.2

C. 10.3

D. 10.9

Answer: c

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397. Solubility of BaF_2 in a solution of $Ba\left(NO_3\right)_2$, will be represented by the concentration term:

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

B. $\left[F^{-}\right]$

C. $\frac{1}{2}\left[F^{-}\right]$

D. $2[NO_3^-]$

Answer: c

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398. Solubility of AgCl in pure water is 10^{-5} mol/litre at $25^{\circ}C$ then, calculate solubility of AgCl in 0.1 M aqueous solution of KCl at 25° C

A. 10^{-9} mol/litre

B. 10^{-5} mol/litre

C. 10^{-7} mol/litre

D. 10^{-4} mol/litre

Answer: a

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399. The solubility of $Mg(OH)_2$ in a buffer of pH=10 is found to be 0.0232 gm/lit. Molar solubility of $Mg(OH)_2$` in pure water would be (in mol/lit)

A. 10^{-5}

B. 3.2×10^{-8}

C. 3.2×10^{-5}

D. 10^{-4}

Answer: d

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400. Assertion : The H_3O^+ has additional water molecules closely associated with it.

Reason : In solid state the species $H_5O_2^+$ and $H_9O_4^+$ have been found to exist.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: b

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401. Assertion : The proton transfer reaction between NH_3 and H_2O proceeds only to a slight extent.

Reason : Proton transfer reaction is virtually complete in the case of HCl in dilute solution.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: b

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402. Assertion : Aqueoous solutions of all strong acids contain only the same acid, the hydronium ion.

Reason : Hydronium ion is the strongest acid that can exist in any significant concentration in dilute aqueous solution.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-3

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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403. Assertion : Acids that have more than one proton that can be donated to base are called polyrotic acids.

Reason : For all diprotic acids, the equilibrium constant K_{a_2} for the second stage of ionisation is smaller than the equilibrium constant, K_{a_1}, for the first stage of ionisation.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-4

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: b

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404. Assertion : $0.20M$ solution of $NaCN$ is more than basic than $0.20M$ solution of NaF.

Reason : K_a of HCN is very much less than that of HF.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-5

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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405. Assertion : $0.20M$ solution of $NaCN$ is more than basic than $0.20M$ solution of NaF.

Reason : K_a of HCN is very much less than that of HF.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-6

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: b

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406. Assertion : Addition of $HCl(aq)$ to $HCOOH(aq)$ decreases the ionization of $HCOOH(aq)$

Reason : Due to common ion effect of H^{+}, ionization of $HCOOH$ decreased.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-7

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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407. Assertion : pH of $10^{-7} MHCl$ is less than 7 at $25^{\circ} C$.

Reason : At very low concentration of HCl, contribution of `H^(+) from water is considerble.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-8

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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408. Statement-1: pH value of acidic buffer solution changes , If buffer solution is diluted upto very large extent.

Statement-2: $\left[H^{+}\right]$ decreases due to change in concentration as well as α increases and decreases in concentration is more as compared to increases in α .

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-9

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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409. Assertion : In a titration of weak monoprotic acid with strong base, the pH at the half equivalent point is pK_a.

Reason : At half equivalence point, it will form acidic buffer at its maximum capacity where [acid] = [salt].

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-10

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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410. Assertion : Solubility of $AgCl$ in $NH_3(aq)$ is greater than in pure water.

Reason : When $AgCl$ dissolve in $NH_3(aq)$, complex ion [$Ag\left(NH_3\right)_2^+$] formation takes place and solubility equilibrium of $AgCl_3$ shifted in forward direction.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-11

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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411. Statement-1: NaCl cannot be hydrolysed.

Statement-2: It is a salt of strong acid and strong base.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-12

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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412. Statement : The dissociation constants of polyrotic acid are in the order $K_1 > K_2 > K_3$.

Explanation : The $\left[H^+\right]$ furnished in first step of dissociation exerts common ion effect to reduce the secend dissociation so on.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-13

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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413. Statement: All strong acids in water show almost almost same acidic nature.

Explanation: This is due to levelling effect of water on account of its high dielectric constant and strong proton accepting tendency.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-14

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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414. Statement: Hydrolysis of salt is an exothermic phenomenon.

Explanation: It involves breaking up of water molecule to produce acids and base respectively.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-15

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: d

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415. Statement: The pH of an aqueous solution of acetic acid remains unchanged on the addition of sodium acetate.

Explanation: The ionisation of acetic acid is suppressed by the addition of sodium acetate.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-16

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: d

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416. Statement: In an acid-basic titration involving a strong base and a weak acid, methyl orange can be used as an indicator.

Explanation: Methyl orange changes its colour in the pH range 3 to 5.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-17

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: d

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417. Statement: A micture of the solution of a weak acid and its conjugates base acts as a good buffer.

Explanation: The ratio of the conjugates base acid in the mixture does not change substantially when small amount of acids or alkalines are added to the buffer.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-18

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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418. Statement-1: 10^{-4} M HCl solution is "more acidic" compared to 1M HCOOH solution. $\left(K_a = 10^{-3}M\right)$

Statement-2: HCl is a strong acid compared to HCOOH.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-19

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: d

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419. Statement-1: Phenophalein does not show any colour change during the titration of $NaHCO_3$ with HCl.

Statement-2: In pressure of phenolphalein, HCl does not reat with $NaHCO_3$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-20

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: c

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420. Statement-1: Aqueous solution of ammonium carbonate is basic.

Statement-2: Acidic/basic nature of a salt solution of a salt of weak acid and weak base depends on K_a and K_b value of the acid and the base forming it.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-21

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 and Statement-2 is True

Answer: a

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421. For which of the following solution must we consider the ionisation of water when calculating the pH or pOH:

A. $3 \times 10^{-6} MHNO_3$

B. $0.10g$ HCl in $1.0L$ of solution

C. $0.0080g$ of $NaOH$ in $0.5L$ of solution

D. $1 \times 10^{-7} Mca(OH)_2$

Answer: a,d

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422. Which of the following increases with dilute at a given temperature?

A. pH of 10^{-3}M acetic acid solution

B. Degree of dissociation of 10^{-3}

C. Degree of dissociation of 10^{-3} M acetic acid

D. Degree of dissociation of 10^{-3} M aniline

Answer: a,c,d

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423. Which of the following statements are correct at $25^{\circ} C$?

A. pK_a for H_3O^+ is 15.74

B. pK_b for OH^- is -1.74

C. $pK_a + pK_b = pK_w$ for HCl and ClOH

D. Degree of dissociation of water is 1.8×10^{-7} %

Answer: b,d

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424. Which of the following pairs will not form a buffer solution?

A. $NaH_2PO_4 + Na_3PO_4$

B. $NaH_2PO_4 + Na_2HPO_4$

C. $Na_2HPO_4 + Na_3PO_4$

D. $H_3PO_4 + Na_3PO_4$

Answer: a,d

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425. The pH of a solution $NaHSO_4\left(K_a = 1.26 \times 10^{-2}\right)$ will :

A. be>7

B. be<7

C. depend on its concentration

D. be independent of dilution

Answer: b,c

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426. A substance A_2H_4 is dissolved in water to form aqueous $K_{b_1} = 4 \times 10^{-5}$ and $K_{b_2} = 10^{-8}$ respectively then which of the option are correct regarding approximate concentration of species when 0.1 M aqueous solution of A_2H_4 is taken:

A. $\left[A_2H_6^{2+}\right] = 10^{-8}M$

B. $\left[H^+\right] = 5 \times 10^{-12}M$

C. $\left[A_2H_5^{2}\right] = 2 \times 10^{-3}M$

D. $\left[OH^-\right] = 2 \times 10^{-3}M$

Answer: a,b,c,d

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427. To a saturated solution of AgCl containing sufficient amount of solid AgCl, NH_3 is gradually added such that its concentration becomes $0.2M$ Which of the following options containing concentration of ion is correct ?

[Given" K_{sp} of $AgCl = 10^{-10}, K_{f_1}$ of $Ag\left(NH_3\right)_2^+ = 10^3, K_f$ of $Ag\left(NH_3\right)_2^+ = 10^8$]

A. $\left[Cl^{-}\right] = 2 \times 10^{-2}M$

B. $\left[Ag\left(NH_3\right)_2\right]^{+} = 2 \times 10^{-2}M$

C. $\left[Ag\left(NH_3\right)\right]^{+} = 2 \times 10^{-2}M$

D. $\left[Ag^{+}\right] = 5 \times 10^{-9}M$

Answer: a,b,c,d

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428. K_w of H_2O at 373 K is 1×10^{-12} Identify which of the following is/are correct?

A. pK_w of H_2O is 12

B. pH of H_2O is 6

C. H_2O is neutral

D. H_2O is acidic

Answer: a,b,c

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429. The degree fo hydrolysis for a salt of strong acid and weak base

A. independent of dilution

B. increases with dilution

C. Increases with dilute

D. increases with decrease in K_b of the bases

Answer: b,c,d

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430. Which of the following is/are correct regarding buffer solution ?

A. It contains weak acid and its conjugate base

B. It contains weak base and its conjugate acid

C. It shows large change in pH on adding small amount of acid or base

D. It's pH remains same even on high dilution

Answer: a,b

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431. A buffer solution can be prepared from a mixture of

A. Sodium acetate and acetic acid in water.

B. Sodium acetate and hydrochloric acid in water.

C. Ammonia and ammonium chloric in water.

D. Ammonia and sodium hydroxide in water.

Answer: a,b,c

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432. Which of the following are true for an acid- base titration?

A. Indicators catalyse the acid base reactions by releasing or accepting H^+ ions.

B. Indicators do not significantly affect the pH of the solution ti which they are added.

C. Acid--base reactions do not occur in absence of indicators.

D. Indicators have different colours in dissciated and undissociated forms.

Answer: b,d

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433. A solution containing a mixture of 0.05M NaCl and 0.05M NaI is taken $\left(K_{sp}\right.$ of $AgCl = 10^{-10}$ and K_{sp} of $\left.AgI = 4 \times 410^{-18}\right)$. When $AgNO_3$ is added to such a solution:

A. the concentration of Ag^+ that can just precipitate

$Cl^- = 2 \times 10^{-9} mol/L$.

B. the concentration of Ag^+ that can just precipa=itate

$I^- = 8 \times 10^{-15} mol/L$

C. $AgCl$ and AgI will be precipatated together.

D. first AgI will be precipitated.

Answer: a,b,d

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434. Choose the correct statement:

A. pH of acidic buffer solution decreases if more salt is added.

B. pH of acidic buffer solution increases if more salt is added.

C. pH of acidic buffer decreases if more salt is added.

D. pH of acidic buffer increases if more salt is added.

Answer: b,c

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435. Which of the following can act as buffer ?

A. $NaCl + NaOH$

B. Borax + Boric acid

C. $NaH_2PO_4 + NA_2HPO_4$

D. $NH_4Cl + NH_4OH$.

Answer: b,c,d

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436. Which of the following will show common ion effect and form a buffer solution?

A. CH_3COONH_4 and CH_3COOH

B. $NH_4Cl + NH_4OH$

C. $H_2SO_4 + NaHSO_4$

D. $NaCl + NaOH$.

Answer: a,b

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437. If $K_{a_1} > K_{a_2}$ of H_2SO_4 are 10^{-2} and 10^{-6} respectively then:

A. $K_{a_1} > K_{a_2}$ because it is easy to abstract H^+ from H_2SO_4 and less easy to abstract H^+ from HSO_4^-

B. K_{a_1} and K_{a_2} may be measured in acetic acid

C. K_{a_1} and K_{a_2} are measured in H_2O

D. the H^+ ion conc. Of $0.01M$ H_2SO_4 will be less than 0.02 M

Answer: a,b

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438. Which of the following solutions added to 1L of a 0.01 M CH_3COOH solution will cause no change in the degree of dissociation of CH_3COOH and pH of the solution ?

$\left(K_a = 1.6 \times 10^{-5}\right.$ for $\left.CH_3COOH\right)$

A. 0.6mM HCOOH $\left(K_a = 8 \times 10^{-4}\right)$

B. 0.1M CH_3COONa

C. $0.4 mMHCl$

D. 0.01M CH_3COOH

Answer: a,c,d

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439. Equal volumes of following solutions are mixed. In which case the pH of resulting solution will be average value of pH of two solutions?

A. Aqueous HCl of pH=2, aqueous $NaOH$ of pH=12

B. Aqueous HCl of pH=2, aqueous HCl of pH=4

C. Aqueous $NaOH$ of pH=12, aqueous $NaOH$ of pH=10

D. Aqueous CH_3COOH of pH=5, aqueous NH_3 of pH=9. $\left[K_a\left(CH_3COOH\right) = K_b\left(NH_3\right)\right]$

Answer: a,d

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440. 100 mL of 0.5 M hydrazoic acid $\left(N_3H, K_a = 3.6 \times 10^{-4}\right)$ and 400 mL of 0.1 M cyanic acid $\left(HOCN, K_a = 8 \times 10^{-4}\right)$ are mixed .Which of the following is true for final solution ?

A. $\left[H^+\right] = 10^{-2}M$

B. $\left[N_3^-\right] = 3.6 \times 10^{-3}M$

C. $\left[OCN^-\right] = 6.4 \times 10^{-3}M$

D. $\left[H^+\right] = 1.4 \times 10^{-2}M$

Answer: a,b,c

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441. K_a values for HA,HB and HD are $10^{-5}, 10^{-7}$ and 10^{-9} respectively. Which of the following will be correct for decimolar aqueous solutions of NaA, NaB , and NaD at $25\,^{\circ}C$

?

A. $(pH)_{Na} < (pH)_{NaB}$

B. $(pH)_{NaD} < (pH)_{NaB}$

C. $(pH)_{NaA < (pH)_{NaD}}$

D. $(pH)_{NaB = 7}$

Answer: a,c,d

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442. When 0.1 mol arsenic acid $\left(H_3AsO_4\right)$ is dissolved in 1L buffer solution of $pH = 8$, which of the following hold good? For arsenic acid : $K_1 = 2.5 \times 10^{-4}, K_2 = 5 \times 10^{-8}, K_3 = 2 \times 10^{-13}$ ['lt' sign denotes that the high concentration is at least more than 100 times the lower one]

A. $\left[H_3AsO_4\right] < \left[H_2AsO_4^{2-}\right]$

B. $\left[H_2\left(AsO_4^{-}\right] < \left[HAsO_4^{2-}\right]$

C. $\left[HAsO_4^{2-}\right] < \left[H_2AsO_4^{-}\right]$

D. $\left[AsO_4^{3-} < \left[HAsO_4^{2-}\right]$

Answer: a,d

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443. Let the colour of the indicator Hin (coloueless) will be visible only when its ionised form (pink) is 25% or more in a solution. Suppose Hin $\left(pK_a = 9.0\right)$ is added to a solution of pH=9.6 predict what will happen? (Take log $2 = 0.3$)

A. Pink colour will be visible

B. Pink colour will not be visible

C. Percentage of ionised will be less than 25 %

D. Precentage of ionised from will be more than 25 %

Answer: a,d

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444. Which of the following mixtures will act as buffer?

A. $H_2CO_3 + NaOH(1.5:1\text{molar ratio})$

B. $H_2CO_3 + NaOH(1.5:2\text{molar ratio})$

C. $NH_4OH + HCl(5:4\text{molar ratio})$

D. $NH_4OH + HCl(4:5\text{molar ratio})$

Answer: a,b,c

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445. $0.1MCH_3COOH$ is diluted at $25^\circ C\left(K_a = 1.8 \times 10^{-5}\right)$, then which of the following will be correct ?

A. $\left[H^+\right]$ will increases

B. pH will increases

C. Number of H^+ will increases

D. pH will decreases

Answer: b,c

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446. The correct increasing order(s) of pH of $0.1M$ - aqueous solution of the following compunds, at $25^\circ C$ is/are:

A. $HCl < CH_3COOH < HCOOH$

B. $H_2SO_4 < HCl < H_3PO_4$

C. $CH_3COOH < CH_3COONH_4 < CH_3COOnNa$

D. $NH_4Cl < CH_3COONH_4 < NH_3$

Answer: b,c,d

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447. In which of the following solutions, the solubility of AgCN will be greater than that in pure water?

(Given : $K_{sp}(AgCN)4 \times 10^{-16}, K_a(HCN) = 5 \times 10^{-10}$)

A. $0.01MAgNO_3$ solution

B. A buffer solution of pH=12

C. 0.2M NH_3 solution

D. A buffer solution of pH=5

Answer: c,d

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448. Which of the following is incorrect statement?

A. If K_1 and K_2 for dissociation of H_2A is 10^{-7} and 10^{-14} then A^{2-} concentration in $0.1MH_2A$ solution is 10^{-7}

B. A solution of pH=1 has H^+ ion concentration 3 times that of a solution of pH=3

C. If a salt solution of weak acid and weak base is dilute upto limited extent then its pH will decreases

D. pH of acidic bufer solution depends upon pK_a and relative molar amount of weak acid and its conjugate base.

Answer: a,b,c

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449. The solubility of a sparingly soluble salt A_xB_x in water at $25^\circ C = 1.4 \times 10^{-4} M$. The solubility product is 1.1×10^{-11} . The possibilities are

A. $x = 1, y = 2$

B. $x = 2, y = 1$

C. $x = 1, y = 3$

D. $x = 3, y = 1$

Answer: a,b

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450. Aqueous solutions of HNO_3, KOH, CH_3COOH,and CH_3COONa of identical concentrations are provided. The pair (s) of solution which form a buffer upon mixing is// are

A. HNO_3 and CH_3COOH

B. KOH and CH_3COONa

C. HNO_3 and CH_3COONa

D. CH_3COOH and CH_3COONa

Answer: c,d

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451. Which statement is/are correct?

A. All Bronsted bases are laso Lewis bases

B. All Bronsted acids are not Lewis acids

C. All cations are acids and anions are bases

D. H_2O can behave as Lewis acid as well aas Lewis base

Answer: a,b,c

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452. Acetic acid and propanoic acid have K_a value 1.75×10^{-5} and 1.3×10^{-5} respectively at a certain temperature. An equimolar solution of a mixture of the two acids is partially neutralised by $NaOH$. How is the ratio of the contents of acetate and propionate ions related to the K_a values and the molarity?

A. $\left(\frac{\alpha}{1 - \alpha}\right) = \frac{1.75}{1.3} \times \left(\frac{\beta}{1 - \beta}\right)$, where α (acetic acid) and β (propanic acid) are ionised fractions of their acids.

B. the ratio is underlated to the K_a values

C. The ratio is unrelated to the molarity of acid.

D. The ratio is unrelated to the pH of the solution.

Answer: a,c,d

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453. For two different acids with same concentration:

A. relative strenght is expressed as $\frac{\alpha_1}{\alpha_2}$

B. relative strenght is expressed as $\frac{K_{a_1}}{K_{a_2}}$

C. relative strenght is expressed as $\sqrt{\left(\frac{K_{a_1}}{K_{a_2}}\right)}$

D. relative strenght is expressed as $\frac{pH_1}{pH_2}$

Answer: a,c

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454. A 0.1M solution of sodium acetate was prepared.

The $K_h = 5.6 \times 10^{-10}$. Then :

A. The degree of hydrolysis is 7.48×10^{-6}

B. the $\left[OH^-\right]$ concentration is $7.48 \times 10^{-3} M$

C. the $\left[OH^-\right]$ concentration is $7.48 \times 10^{-6} M$

D. the pH is approximately 8.88

Answer: c,d

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455. On adding an acid in a sample of pure water at $25^\circ C$:

A. the ionic product of water becomes greater than $10^{14}M^2$

B. the ionic product of water remains $10^{-14}M^2$

C. $\left[H^+\right]$ becomes greater than $\left[OH^-\right]$

D. $\left[OH^-\right]$ becomes zero.

Answer: b,c

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456. On heating a sample of pure water:

A. $\left[H^+\right]$ increases but $\left[OH^-\right]$ decreases.

B. $\left[H^+\right]$ as well as $\left[OH^-\right]$ increases but the sample still remains neutral.

C. the degree of dissociation of water increases but $\left[H^{+}\right]$ remains unchanged.

D. the degree of dissociation of water as well as $\left[H^{+}\right]$ increases.

Answer: b,d

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457. The equilibrium constant for the ionization of $R-NH_2(g)$ in water as:

$R-NH_2(g)+H_2O(l) \Leftrightarrow R-NH_3+(aq)+OH^-(aq)$

is $10^{-6} at 25^{\circ} C.$ Select correct Statement(s).

A. pH of solution is 11 and $P_{RNH_2(g)} = 1$

B. Forward reaction is favoured by additon of HCl(aq)

C. Forward reaction is favoured by addition of $H_2O(l)$

D. Forwared reaction is favoured by addition of $RNH_2(g)$

Answer: a,b,c,d

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458. Select the correct statement regarding salt solution of weak acid and strong base.

A. Solution will be neutral

B. Degree of hyudrolysis increases with increase in dilution

C. shows anionic hydrolysis

D. Phenolphthalein is suitable indicator during titration of weak acid and strong base titration

Answer: b,c,d

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459. Which of the following is correct for 0.1 M BOH solution $\left(k_b = 10^{-5}\right)$?

A. pH of solution is 11

B. $OH^{-} concentration is 10^{-3} mol/$L

C. It's slat with HCl (i.e BCl) form acidic solution in water

D. Phenolphthalein indicator can be used during the titration of BOH with HCl

Answer: a,b,c

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460. select the correcty statement (s)

A. If pOH of aq solution at 70° C is 7, then solution will be acidic.

B. If $\left[H^+\right]$ concentration is decreased 100 times, pH of solution increases by 2 units

C. If solution of $CH_3COON(aq)$ is diluted then pH increases

D. Buffer capacity remains constant with dilution

Answer: a,b

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461. For pure water:

A. pH increases with increase in themperature

B. pH decreases with increase in temperature

C. pH=7 at temperature of $25^\circ C$

D. pH increases as temperature decreases but decreases as stemperature increases

Answer: b,c,d

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462. In the following reaction :

$$[AI]\left(H_2O\right)_6]^3 + H_2O \Leftrightarrow H_3O + \left[AI\left(H_2O\right)_5OH\right]^{+2}$$

A. A is an acid, B is a base

B. A is a base, B is an acid

C. C is conjugate acid of B and D is conjugate base of A

D. C is conjugate base of B and D conjugate acid of A

Answer: a,c

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463. For pure water on small increase in temperature:

A. pH decreases

B. pOH decreases

C. pH increases

D. pOH increases

Answer: a,b

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464. Given that $\triangle H^{\circ}\_(ionization)$ of HX and HY are 30 and $25kJ/mol$ respectively, then which of the following relation $is/arec$ or $rect$?

A. $pK_b\left(X^-\right) < pK_b\left(Y^-\right)$

B. $pK_a(HX) > pK_a(HY)$

C. $pK_a(HX) < pK_a(HY)$

D. $pK_b(X^-) > pK_b(Y^-)$

Answer: a,b

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465. At 25° C, the dissociation constant of a weak monoprotic acid, $HA(K_a$ is numerically equal to the dissociation constant of its conjugate base, $A^-(K_b)$. Which of the following statement(s) is are correct?

A. The dissociation constatn of the acid, HA is $10^{-7} at 25^\circ$ C

B. The pH of 0.1 M aqueous solution of the acid, HA, is 4.0

C. The pH of 0.1 M aqueous solution of the conjugate base (A^-) is 10.0

D. The pH of an aqueous solution containing 0.1 M -HA and

0.01 M - HCl is 2.0

Answer: a,b,c,d

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466. Buffer soution'A' of a weak monoprotic acid and it's sodium salt in concentreaiton ration X:Y has $pH = (pH)_1$ and buffer solution 'B' of the same acid and it's sodium salt in the concentration ratio Y:X has $pH = (pH)_2. If(pH)_2$ - $(pH)_1 + (pH)_2 = 9.5$ units, then:

A. pKa=4.75

B. $\frac{X}{Y} = 2.36$

C. $\frac{X}{Y} = 3.162$

D. pKa=5.25

Answer: a,c

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467. 12.2 gm of sodium salt of weak monbasic acid $\left(K_a = 10^{-6}\right)$ is dissolved in 100 ml of water and pH of resulting solution is found to be 10 at 25° C. Then whichg of the following is corrrect?

A. Molar mass of salt is $122gm/mo \leq$

B. pH of solution when 1 gm of same weak acid is 10^{-8}

C. Molar mass oof conjugate base of same weak acid is 99

D.

Answer: a,b,c,d

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468. Choose the correct statement(s)

A. pH of 0.1 M CH_3 COOH solution decrease with increase in temperature

B. $pHof0.1MNH_4$ OH solution decrease with increse in temperature.

C. 10^{-4} M HCl solution is more acidic than 0.1 M HCN $\left(Ka_{HCN} = 10^{-5}\right.$solution

D. On dilution degree of dissociation of waek electrolytes increase.

Answer: a,d

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469. Which of the following is/are correct informations(s) reagrding 0.4 M solution of weak monobasic acid, HA, AT 25° C?

A. pH of solution is 2.4

B. pOH of soution is 2.4

C. $\left[H^+\right]$ from water is $2.5 \times 10^{-12}M$

D. Percentage of unionised HA molecules is approximatelyt 99%

Answer: a,c,d

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470. A solution capable of maintaining its pH relatively constatn, when either excess acid or excess base is added, is said to be buffered While it is not usually considered a buffered solution, a concentrated solution $\left(10^{-2}\right.$ M and higher) of a strong acid or stong base is buffered against large changes in pH when acids or bases are added.

Buffered solutions are usually those containing a wealk acid and a salt of that weak acid or a weak base and the salt of that weak base. For example a solution containing HAc and NaAC resists large change in pH when acid or alkali is added.

For a buffer solution Buiffer capacity is defined as the number of moles of a strong acid or a strong base that causes 1 of the buffer to undergo a 1 unit change in pH. Buffer capacity is maximum when the molar ratio of the two components is unity and the buffer solution is considerred good.

The least change in pH on adding 0.01 mol of HCl to 1 litre of conc. HCl solutiions will be in case of:

A. 0.1 M HCl solution

B. 0.2 M HCl solution

C. 0.3 M HCl SOLUTION

D. 0.4 M HCl solution

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Which solution is not a buffer solution ?

A. NACN(2 mole)+HCI(1 mole)in 5 L

B. NaCN(1 mole)+HCI(1 mole)in 5 L

C. $NH_3(2mo \le) + HCI(1mo \le) \in 5L$

D. $CH_3COOH(2mo \le) + KOH(1mo \le) \in 5L$

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472. A solution capable of maintaining its pH relatively constatn, when either excess acid or excess base is added, is said to be buffered While it is not usually considered a buffered solution, a concentrated solution $(10^{-2}$ M and higher) of a strong acid or stong base is buffered against large changes in pH when acids or bases are added.

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Which species has the lowest concentration in a solution prepared by mixing 0.1 mole each of HCN and NaCN in 1 L solution? $K_a(HCN) = 10^{-10}$

A. $CN-(-)$

B. HCN

C. H^(+)

D. OH^-

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For a buffer solution Buiffer capacity is defined as the number of moles of a strong acid or a strong base that causes 1 of the buffer to undergo a 1 unit change in pH. Buffer capacity is maximum when the molar ratio of the two components is unity and the buffer solution is considerred good.

Which is the best buffer? $CH_3COOH\left(pK_a = 4.7\right), CH_3COONa(M = 82), CH_3COOH(M = 60)$

A. $8.2gCH_3COONa$ and $6gCH_3COOH$ in litre

B. $8.2gCH_3COONa$ and $8.2gCH_3COOH$ in 10 litre

C. $8.2gCH_3COONa$ and $6gCH_3COOH$ in 2 litre

D. $16.4gCH_3COONa$ and $12GCH_3COOH$ in 4 litre

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474. A solution capable of maintaining its pH relatively constatn, when either excess acid or excess base is added, is said to be buffered While it is not usually considered a buffered solution, a concentrated solution $(10^{-2}$ M and higher) of a strong acid or stong base is buffered against large changes in pH when acids or bases are added.

Buffered solutions are usually those containing a wealk acid and a salt of that weak acid or a weak base and the salt of that weak base. For example a solution containing HAc and NaAC resists large change in pH when acid or alkali is added.

For a buffer solution Buiffer capacity is defined as the number of moles of a strong acid or a strong base that causes 1 of the buffer to undergo a 1 unit change in pH. Buffer capacity is maximum when the molar ratio of the two components is unity and the buffer solution is considerred good.

How many moles of strong acid should be added to best buffer of Q4 to decrease pH byu one unit:

A. 0.0102

B. 0.02045

C. 0.0409

D. 0.115

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475. Equivalence point' in an acid base titration is defined as that point where equivalents of acid become equal to equivalents of base.In case of monoprotic acids and bases there is a single equivalence point, whereas in case of polyprotic acids and bases there may be multiple equivalnece points. Depending upon the type of suybstances present, pH of the soution can be calculated at nay equivalence point.

given that:

$Ka_1, H_3PO_4 = 5 \times 10^{-4}$

$Ka_2, H_3PO = 5 \times 10^{-8}$

$Ka_3, H_3PO_4 = 4.5 \times 10^{-11}(Use: \log 2 = 0.3, \log 3 = 0.4)$

The pH of the solution when 100 ml of 0.1 M NaOH solution at 298 K Is:

A. 8.9

B. 1.5×10^{-9}

C. 5.3

D. 8.5

Answer: a

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$Ka_1, H_3PO_4 = 5 \times 10^{-4}$

$Ka_2, H_3PO = 5 \times 10^{-8}$

$Ka_3, H_3PO_4 = 4.5 \times 10^{-11}(Use : \log 2 = 0.3, \log 3 = 0.4)$

What can be concluded about nature of final solution obtained after mixing 50 ml of 0.1 MH_3PO_4 with 0.1 M KOH at 298 K if volume of KOH solution added is less than or wequal to 50 mL?

A. Neutral

B. Definitely acidic

C. Definitely basic

D. Nature connot be decided munless volume specified.

Answer: b

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given that:

$Ka_1, H_3PO_4 = 5 \times 10^{-4}$

$Ka_2, H_3PO = 5 \times 10^{-8}$

$Ka_3, H_3PO_4 = 4.5 \times 10^{-11} (Use: \log 2 = 0.3, \log 3 = 0.4)$

What can be concluded abouyt the final soution obtained on mixing 200 ml of 0.2 MH_3PO_4 with 50 ml of 0.3 M NaOH solution at 298 K?

A. Tlhe soution will be acidic and will shown buffer [roerties

B. The solution will be acidic but will lnot show buffer proerties

C. The soution will be basic and will show buffer proerites

D. The solution will be basic but will not shown buffer properties

Answer: a

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478. One litre of a saturated solution of $AgBrO_3$ is prepared by adding just sufficient $AgBrO_3$ at $27^{\circ} C$. To this solution copper wire is dipped such that following redox reaction occures to completion.

$Cu(s)2Ag^{+}(aq) \Leftrightarrow 2Ag(s) + Cu^{+}2(aq)$

On drying the wire it was observed that it containde 7.04mg less copper than original.

[Atomic weight of Cu =64]

Equivalents of copper reacted in the above conditon:

A. 1.1×10^{-4}

B. 2.2×10^{-4}

C. 5.5×10^{-5}

D. 0.11

Answer: b

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$Cu(s)2Ag^{+}(aq) \Leftrightarrow 2Ag(s) + Cu^{+}2(aq)$

On drying the wire it was observed that it containde 7.04mg less copper than original.

[Atomic weight of Cu =64]

What will be the solubility of $AgBrO_3$ in another aqueous solution Ph=10 if K_b of AgOH is 10^{-8}?

A. $2.2 \times 10^{-2}M$

B. $4.84 \times 10^{-8}M$

C. $4.84 \times 10^{-4}M$

D. $1.1 \times 10^{-2}M$

Answer: a

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480. Consider a solution of CH_3COONH_4 which is a salt weak acid and weak base.

The equilibrium involved in the solutions are :

$CH_3COO^- + H_2O \Leftrightarrow CH_3COOH + OH^-$ ....(i)

$NH_4^+ + H_2 \Leftrightarrow NH_4OH + H^+$ ....(ii)

$H^+ + OH^- \Leftrightarrow H_2O$ ....(iii)

If we add these reactions, then the net reaction is :

$CH_3COO^- + H_2^+ + H_2O \Leftrightarrow CH_3COOH + NH_4OH$ ....(iv)

Both $CH_3COO^-$and NH_4^+ get hydrolysed independently and their hydrolysis depends on :

(a) their initial concentration

(b) The value of K_h which is $\frac{K_w}{K_a}$ for CH_3COO^- and $\frac{K_w}{K_b}$ for NH_4^+.

Since both of the ions were produced form the salt, their initial concertration are same. Therefore, unless and until the value of $\frac{K_w}{K_a}$ or K_a and K_b is same, the degree of hydrogen of ions can't be same.

To explain why we assume that degree of hydrolysis of cation and anion is same, we needed to now look at the third reaction i.e.,combination of H^+ and OH^- ions. It is obvious that this reaction happens only because one reaction produced H^+ ion and the other prodcued OH^- ions. We can also note that this reaction causes both the hydrolysis reaction to occur more since their product ions are being consumed. Keep this in mind that the equilibrium which has smaller value of the equilibrium constant is affected more by the common ion effect. For the same reason if for any reson a reaction is made to occur to a greater extent by the consumption of any of the prodcut ion, the reaction with the smaller value of equilibrium constant tends to get affected more.

Therefore, we conclude that firstly the hydroylsis of both the ions occurs more in the presence of each other (due to consumption of the product ions) than in each other's absence. Secondly,the hydroylsis of the ion which occurs to a lesser extent (due to smaller value of K_h)is affected more than the one whole K_h is greater. Hence we can see that the degree of hydroylsis of both the ions would be close to each other when they are getting hyderolysed in the presence of each other.

In the hydrolysis of salt weak acid and weak base :

A. degree of hydrolysis of cation and anion is different.

B. degree of hydrolysis of cation and anion is same.

C. degree of hydrolysis of cation and anion is different but they can never be assumed same.

D. degree of hydrolysis of cation and anion is different but they are very close to each other when they are getting hydrolysed in the presence of each other.

Answer: d

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481. Consider a solution of CH_3COONH_4 which is a salt weak acid and weak base.

The equilibrium involved in the solutions are :

$CH_3COO^- + H_2O \Leftrightarrow CH_3COOH + OH^-$ ....(i)

$NH_4^+ + H_2 \Leftrightarrow NH_4OH + H^+$ ....(ii)

$H^+ + OH^- \Leftrightarrow H_2O$ ....(iii)

If we add these reactions, then the net reaction is :

$CH_3COO^- + \overset{+}{H_2} + H_2O \Leftrightarrow CH_3COOH + NH_4OH$ ....(iv)

Both CH_3COO^- and $\overset{+}{NH_4}$ get hydrolysed independently and their hydrolysis depends on :

(a) their initial concentration

(b) The value of K_h which is $\frac{K_w}{K_a}$ for CH_3COO^- and $\frac{K_w}{K_b}$ for $\overset{+}{NH_4}$.

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For 0.1 M CH_3COONH_4 salt solution given, $K_a(CH_3COOH) = K_b(NH_4OH) = 2 \times 10^{-5}$.

In the case : degree of hydrolysis of cation and anion are :

A. exactly same

B. slightly different

C. can't say

D. different but can be taken approximately same

Answer: a

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The equilibrium involved in the solutions are :

$CH_3COO^- + H_2O \Leftrightarrow CH_3COOH + OH^-$ ....(i)

$NH_4^+ + H_2 \Leftrightarrow NH_4OH + H^+$ ....(ii)

$H^+ + OH^- \Leftrightarrow H_2O$ ....(iii)

If we add these reactions, then the net reaction is :

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Both $CH_3COO^-$and NH_4^+ get hydrolysed independently and their hydrolysis depends on :

(a) their initial concentration

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In a solution of $NaHCO_3$, the amphroximately same undergo ionization to form H_+ ion and hydrolysis to form OH^- ion.

$$HCO_3^- + H_2O \overset{\text{ionization}}{\Leftrightarrow} CO_3^{2-} + H_2O$$

$$HCO_3^- + H_2O \overset{\text{hydrolysis}}{\Leftrightarrow} H_3CO_2 + OH^-$$

To calculate ph, suitable approximation is :

A. $\left[CO_3^{2-}\right] = \left[H_2CO_3\right]$

B. degree of ionization = degree of hydolysis

C. both (a) both (b)

D. neither (a) nor(b)

Answer: c

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483. Stroniyum fluoride $\left(SrF_{2.}\right)$ is a sparingly soluble slat. Let s_1 be its solubility (in mol/lt.) in pure water at $25^{\circ}C$, assuming no hydrolysis of F^- ions. Also let s_2 be its solubility (in hydrolysis of F^-ion and no complex formation. However,it is known that $s_1 : s_2 = 10^6 : 256$.

The K_{sp} value of SrF_2 at 25° C is :

A. 2.048×10^{-9}

B. 1.372×10^{-9}

C. 1.864×10^{-9}

D. 2.916×10^{-9}

Answer: a

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The mass of NaF to be added to 100 ml solution of $0.0011 MSr^{+2}$ ions to reduce its concentration to 2×10^{-4}M is : [Assume no hydrolysis of F^- ions.

A. 0.42 g

B. 0.063g

C. 0.021 g

D. 0.084 g

Answer: c

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The solubility of SrF_2 (in mol/L) in a buffer solution of pH=5 at $25\,^\circ$C is :

A. 1.6×10^{-3}

B. 3.2×10^{-3}

C. 4.8×10^{-3}

D. 6.4×10^{-3}

Answer: b

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486. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b\right.$, where K_w is ionic prodcut of water equal to 10-14 at $25\,^{\circ}C$. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^+\right]\left[OH^-\right] = 10^{14}$.Thus, the $\left[H^+\right]$ in a solution is expressed as : $\left[H^+\right] = 10^{-pH}$and $pH + pOH = 14.$ Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base.

Which of the following statements are correct?

(P) At $25\,^{\circ}C, pH of 10^{-10} M NaOH$ is nearly 7.

(Q) The degree of dissociation of a weak acid is given by

$$\frac{1}{1 + 10^{\left(pk_a - pH\right)}}.$$

(R) For weak electrolytes of polyprotic acid nature having no other electrolyte, the anion concentration produced in II step of dissocitation is always equal to K_2 at reasonable concentration of acid.

(S) The concentraion of amide ions produced during self ionisation of NH_3 is equal to concentration of ammonium ions.

Ostwld dilution law is valid for strong electrolytes.

A. P,Q,R and T

B. P,Q,R and S

C. P,R,S and T

D. Q,R,S and T

Answer: b

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487. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b\right.$, where K_w is ionic prodcut of water equal to 10-14 at $25\,^{\circ}$C. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^{+}\right]\left[OH^{-}\right] = 10^{14}$.Thus, the $\left[H^{+}\right]$ in a solution is expressed as : $\left[H^{+}\right] = 10^{-pH}$and $pH + pOH = 14.$ Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base.

(Q) Increase in temperature of pure water decreases its pH.

(R) Increase in temperature of pure water decreases its autoprotolysis.

(S) Increase in temperature of pure water increases its ionic product.

(T) Increase in temperature of pure water decreases degree of dissociation of water.

A. R and T

B. P,Q, and S

C. P and T

D. S and T

Answer: a

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488. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b\right.$, where K_w is ionic prodcut of water equal to 10-14 at $25\,^\circ$C. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^+\right]\left[OH^-\right] = 10^{14}$.Thus, the $\left[H^+\right]$ in a solution is expressed as : $\left[H^+\right] = 10^{-pH}$and $pH + pOH = 14$. Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base.

Which of the follwoing statement are true?

(P) CIO_4^- is weaker base than CIO_3^-

(Q) The degree of dissociation of water at $25\,^\circ C$ is 1.8×10^{-9}

(R)The equilibrium constant for dissociation of H_2O is 1.8×10^{-16}

(S) PO_4^{3-} is conjugate acid of HPO_4^{2-}

A. P,Q,R

B. Q,R,S

C. P,Q,S

D. P,Q

Answer: a

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489. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b\right.$, where K_w is ionic prodcut of water equal to 10-14 at $25\,^\circ$C. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^{+}\right]\left[OH^{-}\right] = 10^{14}$.Thus, the $\left[H^{+}\right]$ in a solution is expressed as : $\left[H^{+}\right] = 10^{-pH}$and $pH + pOH = 14$. Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base. Which of the following solution is most important buffer for human living?

A. $HCO_3^{-}$and CO_3^{2-}

B. $CH_3COO^{-}$and CH_3COOH

C. NH_4^{-} and NH_4OH

D. None of the above

Answer: a

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490. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b,\right.$ where K_w is ionic prodcut of water equal to 10-14 at $25\,^{\circ}$C. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^+\right]\left[OH^-\right] = 10^{14}$.Thus, the $\left[H^+\right]$ in a solution is expressed as : $\left[H^+\right] = 10^{-pH}$and $pH + pOH = 14.$ Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base. The pK_a value of $\overset{+}{NH_4}$ is 9. The pK_b value of NH_4OH would be

:

A. 9

B. 5

C. 7

D. 8

Answer: b

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491. The dissociation of weak electrolyte (a weak base or weak acid) id expressed in terms of Ostwald dilution law. An acid is a substance which furnishes a proton or accepts an electron pair whereas a base is proton acceptor or electron pair donor. Storonger is the acid weaker is its conjugate base. The dissociation constants of an acid $\left(K_a\right)$ and its conjugate base are related by $\left(K_w = K_a \times K_b\right.$, where K_w is ionic prodcut of water equal to 10-14 at $25\,°$C. The numerical value of K_w however increases with temperature. In a solution of an acid or base $\left[H^+\right]\left[OH^-\right] = 10^{14}$.Thus, the $\left[H^+\right]$ in a solution is expressed as : $\left[H^+\right] = 10^{-pH}$and $pH + pOH = 14.$ Buffer solutions are the solutions which do not show appreciable change in the pH on addition of small amount of acid or base. $0.16g$ of $N_2H_4\left(K_b = 4 \times 10^{-6}\right)$ is dissolved in water and the total volume of solution in made upto 500mL. The percentage of N_2H_4 that reacts with water is :

A. $2\,\%$

B. $3\,\%$

C. $1\,\%$

D. $4\,\%$

Answer: a

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492. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At 50% ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

Which among the followig statements are correct?

(P) At equivalence point of NaOH AND HCI,pH=7

(Q) At equivalence point of NaOH and $CH_3COOH, pH > 7$

(R) At equivalence point of NH_4OH and $HCI, pH < 7$

(S) An indicator shows best results if equivalence point is within the pH range $pK_{In} \pm 1$

(T)) At equivalence point of NH_4OH and formic acid $pH < 7$

A. P,Q,R,S and T

B. P,R,S and T

C. P,S and T

D. P,Q,R and T

Answer: a

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493. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At 50% ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

The dissociation constant of an acid-base indicator which furnishes colorued cation is 1×10^{-5}. The pH of solution at which indicator will furnish its colour is :

A. 5

B. 9

C. 6

D. 10

Answer: b

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494. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At 50% ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

The dissociation constant on an acid-base indicator which furnishes coloured anion is 1×10^{-5}. The pH solution at which indicator will furnish its colour is :

A. 5.2

B. 5.6

C. 8.4

D. 8.48

Answer: b

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495. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At $50\,\%$ ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

Bromophenol blue is an acid having dissociation constant 5.48×10^{-5}. The percentage of coloured ion furnished at a ph of 4.84 is :

A. 80 %

B. 40 %

C. 20 %

D. 90 %

Answer: a

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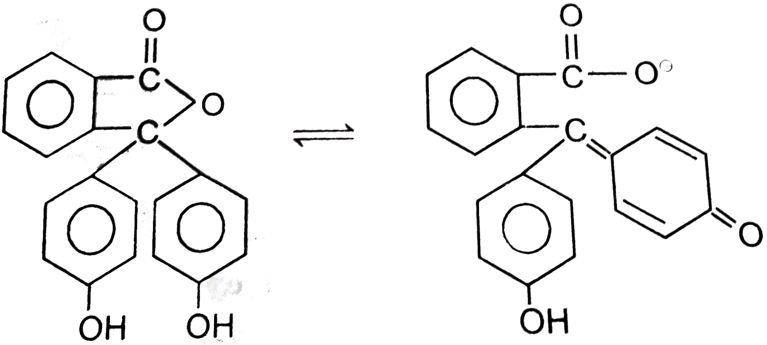
496. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At $50\,\%$ ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

The indicator phenolphthalein is a tautomeric mixture of two forms as given below:



I II

Which of the following statements are correct?

The form II is referred as quinonoid form and is deeper is colour.

(Q)The form I is referred as quinonoid form and is light in colour.

(R) The form II is more stable in alkaline medium.

(S) The change is pH from acidic to alkaline solution bring in the more and more conversion of I form to II form.

(T) The form I is more stable in acidic medium.

A. P,Q,R and S

B. P,R,S and T

C. R,S and T

D. Q,R,S and T

Answer: b

Watch Video Solution

497. During the neutralisation of an acid by a base, the end point refers to the completion of reaction. The detection of end point in acid-base neutralisation is usually made by an acid-base indicator. An acid-base indicator is itself a weak acid (Phenolphthalein) or a weak base (Methyl orange). At 50% ionisation which depends on the medium. the anion furnished by an indicator (acid) cation furnished colour to solution at end point. For example, phenolphthalein dissociation

$$HIn\text{Colourless} \rightarrow H^{+} + In^{-}\text{Pink}, K_{HIn} = \frac{\left[H^{+}\right]\left[In^{-}\right]}{[HIn]}$$

is favoured in presence of alkali and pink colour of phenolphthalein ion is noticed as soon as the medium changes to alkali nature. The end point of acid-base neutralisation not necessarily coincides with eqivalence point but it is closer to equivalence point. Also at equivalence point of acid-base neutralisation, pH is not necessarily equal to 7.

Which of the following statements are correct?

(P) Phenolphthalein is not a good indicator for weak alkali titrations.

(Q) Phenolphthalein does not give pink colour with weak alkalies as NH_4OH

(R) Phenolphthalein is an basic indicator and imparts colour in basic medium.

A. P,Q,S and T

B. P,Q,R and S

C. P and R

D. Q and S

Answer: c

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498. The Ph of basic buffer mixtures is given by : $Ph = Pk_a + \log \frac{[\text{Base}]}{[\text{Salt}]}$ whereas Ph of acidic buffer mixtures is given by : Ph $= pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$. Addition of little acid or base although shows no appreciable change in Ph for all practical purposes, but sicne the ratio $\frac{[\text{Base}]}{[\text{Salt}]}$ or $\frac{[\text{Salt}]}{[\text{Acid}]}$ changes, a slight decrease or increase in pH results.

The amount of $(NH_4)_2SO_4$ to be added to 500mL of 0.01 M NH_4OH solution $(pH_aNH_4^+$ is 9.26) to prepare a buffer of pH 8.26 is :

A. 0.05 mole

B. 0.025 mole

C. 0.10 mole

D. 0.005 mole

Answer: b

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499. The Ph of basic buffer mixtures is given by : $Ph = Pk_a + \log \frac{[\text{Base}]}{[\text{Salt}]}$ whereas Ph of acidic buffer mixtures is given by : Ph $= pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$. Addition of little acid or base although shows no appreciable change in Ph for all practical purposes, but sicne the ratio $\frac{[\text{Base}]}{[\text{Salt}]}$ or $\frac{[\text{Salt}]}{[\text{Acid}]}$ changes, a slight decrease or increase in pH results.

A solution containing 0.2 mole of dichloroacetic acid $\left(K_a = 5 \times 10^{-2}\right)$ and 0.1 mole sodium dichloracetate in one litre solution has $\left[H^+\right]$:

A. 0.05 m

B. 0.025 m

C. 0.10 m

D. 0.005 m

Answer: a

Watch Video Solution

500. The Ph of basic buffer mixtures is given by : $Ph = Pk_a + \log \frac{[\text{Base}]}{[\text{Salt}]}$ whereas Ph of acidic buffer mixtures is given by : Ph $= pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$. Addition of little acid or base although shows no appreciable change in Ph for all practical purposes, but sicne the ratio $\frac{[\text{Base}]}{[\text{Salt}]}$ or $\frac{[\text{Salt}]}{[\text{Acid}]}$ changes, a slight decrease or increase in pH results.

The volume of 0.2 m NaOH needed to prepare a buffer of pH 4.74 with 50 mL of 0.2 m acetic acid pH_b of $CH_3COO^- = 9.26$ is :

A. 50mL

B. 25mL

C. 20mL

D. 10mL

Answer: b

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501. The Ph of basic buffer mixtures is given by : $Ph = Pk_a + \log \frac{[\text{Base}]}{[\text{Salt}]}$ whereas Ph of acidic buffer mixtures is given by : Ph $= pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$. Addition of little acid or base although shows no appreciable change in Ph for all practical purposes, but sicne the ratio $\frac{[\text{Base}]}{[\text{Salt}]}$ or $\frac{[\text{Salt}]}{[\text{Acid}]}$ changes, a slight decrease or increase in pH results.

The ratio of pH of solution (I) containing 1 mole to pH of solution (II) containing 1 mole of CH_3COONa and 1 mole of acetic in one litre is :

A. $1:2$

B. $2:1$

C. $1:3$

D. $3:1$

Answer: a

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502. The solubility product of a soluble salt A_xB_y is given by : $K_{sp} = \left[A^{y+}\right]^z\left[B^{x-}\right]^y$. As soon as prodcut of concentration of A^{y+} and B_{x-}. Becomes more than its K_{sp}, the salt starts precipitation. It may practically be noticed that AgCl is more soluble in water and its solubility decreases dramatically in 0.1m NaCl or 0.1 m $AgNO_3$ solution. It can be concluded that in presence of a common ion the solubility of salt decreases. The salting out action of RCOONa (soap) in presence of NaCl is based on :

A. Buffering action

B. Hydrolysis of salt

C. Solubility product

D. Complex formation

Answer: c

Watch Video Solution

503. The solubility product of a soluble salt A_xB_y is given by : $K_{sp} = \left[A^{y+}\right]^z\left[B^{x-}\right]^y$. As soon as prodcut of concentration of A^{y+} and B_{x-}. Becomes more than its K_{sp}, the salt starts precipitation. It may practically be noticed that AgCI is more soluble in water and its solubility decreases dramatically in 0.1m NaCI or 0.1 m $AgNO_3$ solution. It can be concluded that in presence of a common ion the solubility of salt decreases. K_{sp} of SrF_2 in water is 8×10^{-10}. The solubility of SrF_2 in 0.1MNaF aqueous solution is :

A. 8×10^{-10}

B. 2×10^{-3}

C. 2.71×10^{-10}

D. 8×10^{-8}

Answer: d

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504. The solubility product of a soluble salt A_xB_y is given by : $K_{sp} = \left[A^{y+}\right]^z\left[B^{x-}\right]^y$. As soon as prodcut of concentration of A^{y+} and B_{x-}. Becomes more than its K_{sp}, the salt starts precipitation. It may practically be noticed that AgCI is more soluble in water and its solubility decreases dramatically in 0.1m NaCI or 0.1 m $AgNO_3$ solution. It can be concluded that in presence of a common ion the solubility of salt decreases.

Equal volumes of two solutions are mixed. The one in which $CaSO_4\left(K_{sp} = 2.4 \times 10^{-5}\right)$ is precipitated is :

A. $0.02MCaCI_2 + 0.0004MNa_2SO_4$

B. $0.01MCaCI_2 + 0.0004MNa_2SO_4$

C. $0.02MCaCI_2 + 0.0002MNa_2SO_4$

D. $0.03MCaCI_2 + 0.0002MNa_2SO_4$

Answer: d

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505. The solubility product of a soluble salt A_xB_y is given by : $K_{sp} = \left[A^{y+}\right]^z\left[B^{x-}\right]^y$. As soon as prodcut of concentration of A^{y+} and B_{x-}. Becomes more than its K_{sp}, the salt starts precipitation. It may practically be noticed that AgCI is more soluble in water and its solubility decreases dramatically in 0.1m NaCI or 0.1 m $AgNO_3$ solution. It can be concluded that in presence of a common ion the solubility of salt decreases.

The pH of a saturated solution of Mg$(OH)_2$ is :

$\left(K_{sp}Mg(OH)_2 = 1 \times 10^{-11}\right.$

A. 9

B. 3.87

C. 10.43

D. 5

Answer: c

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506. The solubility product of a soluble salt A_xB_y is given by : $K_{sp} = \left[A^{y+}\right]^z\left[B^{x-}\right]^y$. As soon as prodcut of concentration of A^{y+} and B_{x-}. Becomes more than its K_{sp}, the salt starts precipitation. It may practically be noticed that AgCl is more soluble in water and its solubility decreases dramatically in 0.1m NaCl or 0.1 m $AgNO_3$ solution. It can be concluded that in presence of a common ion the solubility of salt decreases.

Which of the following statements wrong?

A. K_{sp} of salt depends upon temperature

B. $K_{sp}$of a salt has no units

C. The K_{sp} of salt, A_xB_y can be given as :$x^xy^y(s)^{x+y}$ where s is the mole/litre solubility of salt.

D. Solubility of BaF_2 in a solution of $Ba\left(NO_3\right)_2$ can be given by $\frac{1}{2}\left[F^-\right]$.

Answer: b

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507. For the self-ionisation (protonation) process liquid formic acid at 20 ° C.

$HCOOH + HCOOH \rightarrow HCOOH_2^+ + HCOO^-$

the equilibrium constant,

$$K = \frac{\left[HCOOH_2^+\right]\left[HCOO^-\right]}{[HCOOH]^2} = 10^{-10}$$

At 20 ° C, the density of liquid formic acid is 0.92 gm/mL.

The ionic prodcut of formic acid,$K = \left[HCOOH_2^+\right]\left[HCOO^-\right]$ is

:

A. $10^{-10}M^2$

B. $4.0 \times 10^{-8}M^2$

C. $2.5 \times 10^{-13}M^2$

D. $2.0 \times 10^{-9}M^2$

Answer: b

Watch Video Solution

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508. For the self-ionisation (protonation) process liquid formic acid at 20 ° C.

$$HCOOH + HCOOH \rightarrow HCOOH_2^+ + HCOO^-$$

the equilibrium constant,

$$K = \frac{\left[HCOOH_2^+\right]\left[HCOO^-\right]}{[HCOOH]^2} = 10^{-10}$$

At 20 ° C, the density of liquid formic acid is 0.92 gm/mL.

What percentage of formic acid molecules are self ionised?

A. 0.02 %

B. 0.001 %

C. 0.005 %

D. 0.002 %

Answer: d

Watch Video Solution

509. For the self-ionisation (protonation) process liquid formic acid at $20\,^{\circ}$ C.

$$HCOOH + HCOOH \rightarrow HCOOH_2^+ + HCOO^-$$

the equilibrium constant,

$$K = \frac{\left[HCOOH_2^+\right]\left[HCOO^-\right]}{[HCOOH]^2} = 10^{-10}$$

At $20\,^{\circ}$ C, the density of liquid formic acid is 0.92 gm/mL.

How many formate ions $\left(HCOO^-\right)$ are present in each 5ml of liq.formic acid at $20\,^{\circ}$ C? $\left(N_A = 6 \times 10^{23}\right)$

A. 2×10^{-4}

B. 1.2×10^{20}

C. 6×10^{17}

D. 3×10^{21}

Answer: c

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510. Amino acid glycine $\left(NH_2-CH_2-COOH\right)$ exists as a zwitter ion in aq. Solution. The K_a and K_b values of glycine are $1.6 \times 10^{-10}\left(Pk_a = 9.8\right)$and $2.5 \times 10^{-12}\left(pk_b = 11.6\right)$ respectively. The K_a and K_b values are for zwitter ion of Amino acid with following strctures $\left[NH_3^+ - CH_2 - COO^-\right]$ What is the K_b for $-NH_2$ group in glycine?

A. 4×10^{-3}

B. 1.6×10^{-10}

C. 6.25×10^{-5}

D. 2.5×10^{-12}

Answer: c

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511. Amino acid glycine $\left(NH_2 - CH_2 - COOH\right)$ exists as a zwitter ion in aq. Solution. The K_a and K_b values of glycine are $1.6 \times 10^{-10}\left(Pk_a = 9.8\right)$and $2.5 \times 10^{-12}\left(pk_b = 11.6\right)$ respectively. The K_a and K_b values are for zwitter ion of Amino acid with following strctures $\left[NH_3^+ - CH_2 - COO^-\right]$ An aqueous solution of glycine has pH:

A. nearly 7

B. nearly 7.9

C. nearly 6.1

D. nearly 11.5

Answer: c

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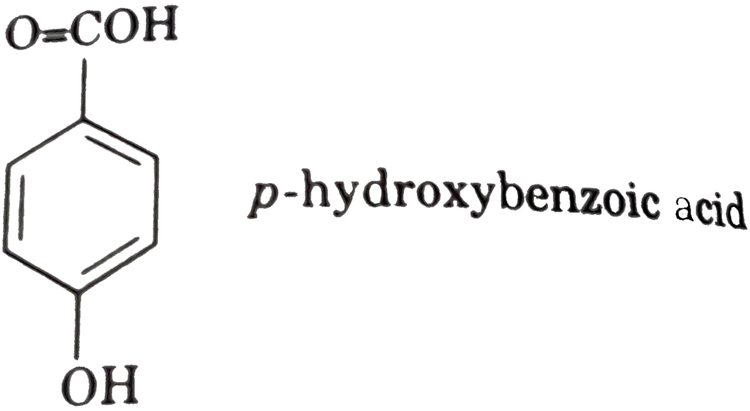
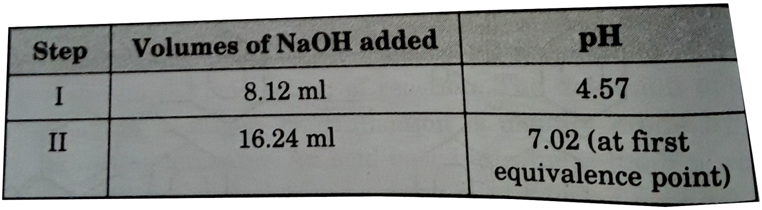
512. Following titration method is taken to compute stepwise ionisation constant of a weak dibasic acid

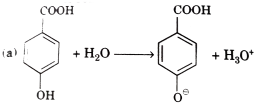


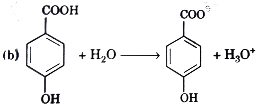


Step	Volumes of NaOH added	pH
I	8.12 ml	4.57
II	16.24 ml	7.02 (at first equivalence point)

has two ionisable protons and there can be stepwise neutralisation by NaOH.

Which H^+ removed in step I?

A. 

B. 

C. (c) Both 50%in each part

D. $H_2 + H_2O \rightarrow H_3O + OH^-$ (autoprotolysis of H_2O)

Answer: b

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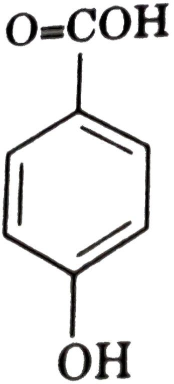
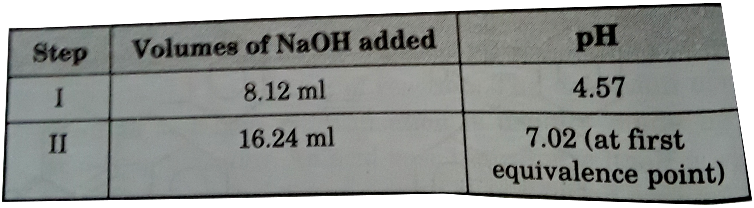
513. Following titration method is taken to compute stepwise ionisation constant of a weak dibasic acid



p-hydroxybenzoic acid



Step	Volumes of NaOH added	pH
I	8.12 ml	4.57
II	16.24 ml	7.02 (at first equivalence point)

has two ionisable protons and there can be stepwise neutralisation by NaOH.

Which H^+ removed in step I?

$pK_{a_1}\left(= -\log K_{a_1}\right)$ of p-hydroxybenzonic acid is :

A. 4.57

B. 9.47

C. 4.9

D. 7

Answer: a

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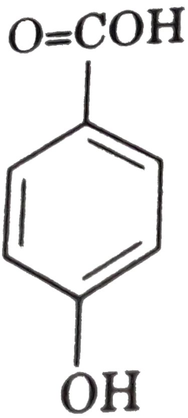
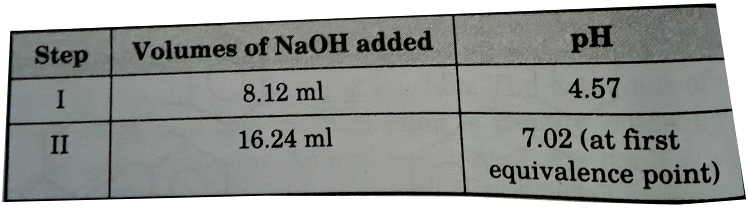
514. Following titration method is taken to compute stepwise ionisation constant of a weak dibasic acid



p-hydroxybenzoic acid



Step	Volumes of NaOH added	pH
I	8.12 ml	4.57
II	16.24 ml	7.02 (at first equivalence point)

has two ionisable protons and there can be stepwise neutralisation by NaOH.

Which H^+ removed in step I?

$pK_{a_2}\left(= -\log K_{a_2}\right)$ of p-hydroxybexzonic acid is nearly:

A. 4.5

B. 7

C. 9.5

D. 5

Answer: c

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515. Acetic acid tends to form dimer due to formation of intermolcular hydrogen bonding.

$2CH_2COOH \Leftrightarrow (CH_3COOH)_2$

The equilibrium constant for this reaction is $1.5 \times 10^2 M^{-1}$in benzene solution and 3.6×10^{-2} in water. In benzene, monomer does not dissociate but it water, monomer dissociation simultaneously with acid dissociation constant 2.0×10^{-5}M. Dimer does not dissociate in benzene as well as water.

The molar ration of dimer to monomer for 0.1 M acetic acid in benzene is equal to :

A. $150:1$

B. $1:150$

C. $5:2$

D. $2:5$

Answer: c

Watch Video Solution

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516. Acetic acid tends to form dimer due to formation of intermolcular hydrogen bonding.

$2CH_2COOH \Leftrightarrow \left(CH_3COOH\right)_2$

The equilibrium constant for this reaction is $1.5 \times 10^2 M^{-1}$in benzene solution and 3.6×10^{-2} in water. In benzene, monomer does not dissociate but it water, monomer dissociation simultaneously with acid dissociation constant 2.0×10^{-5}M. Dimer does not dissociate in benzene as well as water.

The molar ratio of dimer to monmer for 0.1M acetic acid in water (neglecting the dissciation of acetic acid in water) is equal to :

A. $250 : 1$

B. $1 : 250$

C. $9 : 2500$

D. $2500 : 9$

Answer: c

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517. Acetic acid tends to form dimer due to formation of intermolcular hydrogen bonding.

$2CH_2COOH \Leftrightarrow \left(CH_3COOH\right)_2$

The equilibrium constant for this reaction is $1.5 \times 10^2 M^{-1}$ in benzene solution and 3.6×10^{-2} in water. In benzene, monomer does not dissociate but it water, monomer dissociation simultaneously with acid dissociation constant 2.0×10^{-5}M. Dimer does not dissociate in benzene as well as water.

The pH of 0.1M acetic acid solution in water, considering the simultaneous dimerisation and dissociation of acid is :

A. 1

B. 2.85

C. 5.7

D. 3.42

Answer: b

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518. 100ml of 0.1M H_3PO_4 is titrated with 0.05 M NaOH solution till 2nd equivalent point. Then, resultant solution was mixed with 10 ml of 0.5 MHCl solution

$K_1 = 10^{-3}M$

$K_2 = 10^{-8}M$

$K_3 = 10^{-13}M$

pH at 2nd equivalent point will be :

A. 5.5

B. 10.5

C. 8

D. 7

Answer: b

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519. 100ml of 0.1M H_3PO_4 is titrated with 0.05 M NaOH solution till 2nd equivalent point. Then, resultant solution was mixed with 10 ml of 0.5 MHCl solution

$K_1 = 10^{-3}M$

$K_2 = 10^{-8}M$

$K_3 = 10^{-13}M$

pH after HCl was added will be :

A. 8

B. 3

C. 5.5

D. 0.3

Answer: a

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520. 100ml of 0.1M H_3PO_4 is titrated with 0.05 M NaOH solution till 2nd equivalent point. Then, resultant solution was mixed with 10 ml of 0.5 MHCl solution

$K_1 = 10^{-3} M$

$K_2 = 10^{-8} M$

$K_3 = 10^{-13} M$

Solubility of compound $A(OH)_2$ in final solution will be :

A. $10_{10} M$

B. $4 \times 10^{-10} M$

C. $4 \times 10^{-22} M$

D. $4 \times 10^{-14} M$

Answer: b

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521. Selective precipitation of ions in a mixture in the form of salts can be adding common ions gradually. Let us condsider selective precipitation of CI^- and CrO_4^{2-} ions in the form of AgCl and Ag_2Cro_4 form a mixture having having 0.01M CI^- and 0.01M CrO_4^{2-}. For this, salt having Ag^+ [like $AgNO_3(s)$] is added gradually. Given : $K_{sp}[AgCI] = 10^{-10}$ and $K_{sp}\left[Ag_2CrO_4\right] = 4 \times 10^{-14}$

Minimum concentration of Ag^+ ion at which precipitation of at least one ion starts.

A. $10^8 M$

B. $1.41 \times 10^{-6} M$

C. $10^{-10} M$

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

Answer: a

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522. Selective precipitation of ions in a mixture in the form of salts can be adding common ions gradually. Let us condsider selective precipitation of CI^- and CrO_4^{2-} ions in the form of AgCl and Ag_2Cro_4 form a mixture having having 0.01M CI^- and 0.01M CrO_4^{2-}. For this, salt having Ag^+ [like $AgNO_3(s)$] is added gradually. Given : $K_{sp}[AgCI] = 10^{-10}$ and $K_{sp}\left[Ag_2CrO_4\right] = 4 \times 10^{-14}]$

The percentage of one ion precipitated when another ion starts precipitation is :

(Given: $\frac{1}{\sqrt{2}} = 0.7$)

A. 98.7%

B. 99.7%

C. 97.3%

D. 92.7%

Answer: b

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523. 0.3 g of CH_3COOH is dissolved in 100ml water to prepare a solution X. Now,0.2gm of NaOH is added in solution X to form solution Y. Finall, 0.245 g of H_2SO_4 is added in Y to prepare solution Z,(Only Ist Hydrogen is ionizable). CH_3COOH behave like a weak acid with $K_a = 10^{-5}$.

[Moleucular weight :$CH_3COOH = 60$,

$NaOH = 40, H_2SO_4 = 98\Big]$[log7=0.85]

What is the approximate pH of solution (Y) ?

A. 5.15

B. 8.85

C. 8.15

D. 9.95

Answer: b

Watch Video Solution

524. 0.3 g of CH_3COOH is dissolved in 100ml water to prepare a solution X. Now,0.2gm of NaOH is added in solution X to form solution Y. Finall, 0.245 g of H_2SO_4 is added in Y to prepare solution Z,(Only Ist Hydrogen is ionizable).

CH_3COOH behave like a weak acid with $K_a = 10^{-5}$.

[Moleucular weight $:CH_3COOH = 60$, $NaOH = 40, H_2SO_4 = 98\Big]$[log7=0.85]

What is the pH of solution (Z) ?

A. 5

B. 6

C. 8

D. 5

Answer: a

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525. The equilibrium equation and K_a values for the three acids are given at $25^\circ C$:

$HA(aq) + H_2O \Leftrightarrow H_3O^+(aq) + A^-(aq), K_a = 2 \times 10^{-5}$

$HB(aq) + H_2O \Leftrightarrow H_3O^+(aq) + B^-(aq), K_a = 4 \times 10^{-6}$

$HC(aq) + H_2O \Leftrightarrow H_3O^+(aq) + C^-(aq), K_a = 1 \times 10^{-4}$

Which conjugate pair would be best for preparing a buffer witha pH =54? (log 2=0.3).

A. $HA + A^-$

B. $HB + B^-$

C. $HC + C^-$

D. $H_2O + H_3O^+$

Answer: b

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526. The equilibrium equation and K_a values for the three acids are given at $25\,^{\circ}C$:

$HA(aq) + H_2O \Leftrightarrow H_3O^{+}(aq) + A^{-}(aq), K_a = 2 \times 10^{-5}$

$HB(aq) + H_2O \Leftrightarrow H_3O^{+}(aq) + B^{-}(aq), K_a = 4 \times 10^{-6}$

$HC(aq) + H_2O \Leftrightarrow H_3O^{+}(aq) + C^{-}(aq), K_a = 1 \times 10^{-4}$

The pH of 0.2M aqueous HA solution is :

A. 3.70

B. 2.70

C. 1.70

D. 2.35

Answer: b

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527. The equilibrium equation and K_a values for the three acids are given at $25^\circ C$:

$HA(aq) + H_2O \Leftrightarrow H_3O^+(aq) + A^-(aq), K_a = 2 \times 10^{-5}$

$HB(aq) + H_2O \Leftrightarrow H_3O^+(aq) + B^-(aq), K_a = 4 \times 10^{-6}$

$HC(aq) + H_2O \Leftrightarrow H_3O^+(aq) + C^-(aq), K_a = 1 \times 10^{-4}$

The pH of 0.1M aqueous NaC solution is : (NaC is sodium salt of acid HC)

A. 2.5

B. 11.5

C. 9.5

D. 8.5

Answer: d

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528. Human blood has a narrow Ph range of 7.3 - 7.4, which must be maintained for methabolic processes to function properly. To keep the Ph in this range requires a delicate balance between the concentration of the conjugate acid-base pairs making upto the buffer system. The main buffer is a carbonic acid/ hydrogencarbonate system, which involves the following three equilibria.

$CO_2(g) \Leftrightarrow CO_2(aq)$

$CO_2(aq) + H_2O(l) \Leftrightarrow H_2CO_3(aq)$

$H_2CO(aq) + H_2O(l) \Leftrightarrow HCO_3^-(aq) + H_3O^+(aq)$

Carbonic acid $\left(H_2CO_3\right)$ is a weak acid and HCO_3^-(aq) is its conjugate base. At the temperature of the human body, the pK_a for carbonic acid is 6.4 However, the normal concentration of $CO_2(g)$ in the lungs maintanis a ratio of $HCO_3^-(aq)/H_2CO_3(aq)$ in blood plasma of about $8:1$.

The carbonic acid concentration in the bloos is largely controlled by breathing and respiration. Hydrogencarbonate ion concentration is largely controlled by excreation in urine. If blood pH rises above 7.4, a potentially life-threatening conditon called alkalosis can result. This can happen in patients who are hyperventilating from severse anxiety, or in climbers suffereing from oxygen deficency at high altitude. (Given: log 2=0.3)

Calculate pH of blood at the temperature of the human body.

A. 7.4

B. 7.3

C. 7.35

D. 6.7

Answer: b

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529. Human blood has a narrow Ph range of $7.3 - 7.4$, which must be maintained for methabolic processes to function properly. To keep the Ph in this range requires a delicate balance between the concentration of the conjugate acid-base pairs making upto the buffer system. The main buffer is a carbonic acid/ hydrogencarbonate system, which involves the following three equilibria.

$CO_2(g) \Leftrightarrow CO_2(aq)$

$CO_2(aq) + H_2O(l) \Leftrightarrow H_2CO_3(aq)$

$H_2CO(aq) + H_2O(l) \Leftrightarrow HCO_3^-(aq) + H_3O^+(aq)$

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Calculate the maximum permissible value of $\frac{[H_2CO_3]}{[HCO_3^-]}$ in the human blood to just prevent alkalosis.

A. 10

B. 8

C. 0.1

D. 0.35

Answer: c

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The carbonic acid concentration in the bloos is largely controlled by breathing and respiration. Hydrogencarbonate ion concentration is largely controlled by excreation in urine.

If blood pH rises above 7.4, a potentially life-threatening conditon called alkalosis can result. This can happen in patients who are hyperventilating from severse anxiety, or in climbers suffereing from oxygen deficency at high altitude. (Given: log 2=0.3)

Select the correct option.

A. One way to treat alkalosis can be to get the patient to breathe more quickly so that amount of CO_2 exhaled increases and your system becomes deficient in CO_2.

B. One way to treat alkalosis can be to get the patient into a bag so that the exhaled CO_2 is reinhaled.

C. Ph of blood is independent of concentraiton of CO_2

D. Alkalosis can't be controlled by breathing and respiration.

Answer: b

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531. We represent various reagents pictorially such that,

▤ ⇒ 0.1 M strong acid

▥ ⇒ 0.1 M strong base

▨ ⇒ 0.1 M weak acid ($K_a = 10^{-5}$)

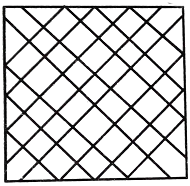
▧ ⇒ 0.1 M weak base ($K_b = 10^{-5}$)

The relative area of the squars represents the relative volume of the reagents used and the overlapping region represents the relative amount of mixing of the reagents.

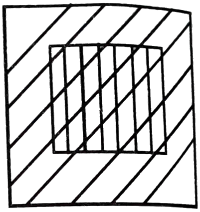
(Use log 5=0.7,log2=0.3,log3=0.5,$d_{H_2O} = 1gml^{-1}$)

Which of the following leads to buffer formation?

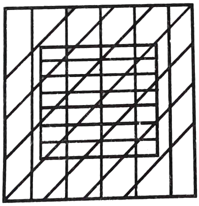
A. (a)



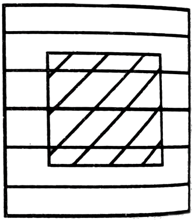
B. (b)



C. (c)



D. (d)



Answer: a,b,c

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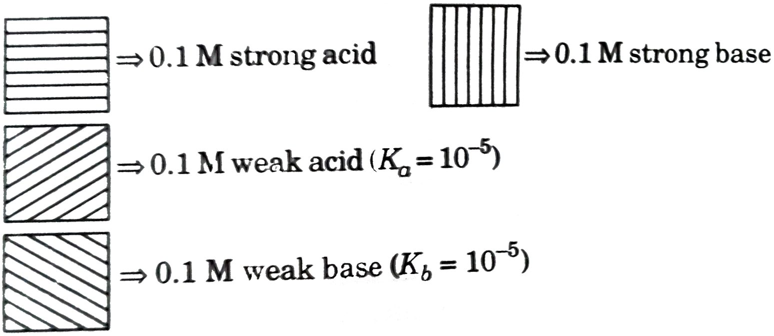
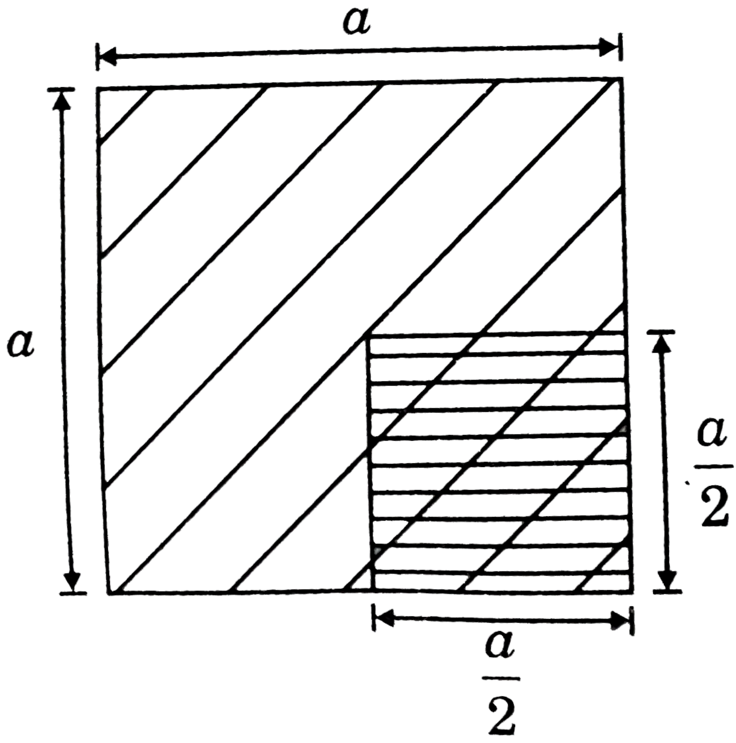
532. We represent various reagents pictorially such that,



The relative area of the squars represents the relative volume of the reagents used and the overlapping region represents the relative amount of mixing of the reagents.

(Use log 5=0.7,log2=0.3,log3=0.5,$d_{H_2O} = 1gml^{-1}$)

For a solution represented by



Which is/are correct?

A. Ph=1

B. α of weak acid =5×10^{-4}

C. α of $H_2O = 9 \times 10^{-15}$

D. Ph=1.7

Answer: b,c,d

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533. 200 ml of an aqueous solution contains $0.1 M NaOH$ and $0.2 M NH_4OH(aq)$. In a titration experiment, $0.1 M HCI(aq)$ solution is slowly added to it. Given $K_b\left(NH_4OH\right) = 10^{-5}$ On adding $200 mL$ of $HCI(aq)$ solution, final pH of solution will be:

A. 5

B. 7

C. 9

D. 11

Answer: d

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534. 200 ml of an aqueous solution contains $0.1 MNaOH$ and $0.2 MNH_4OH(aq)$. In a titration experiment, $0.1 MHCI(aq)$ solution is slowly added to it. Given $K_b\left(NH_4OH\right) = 10^{-5}$

On adding $400 mL$ of HCl solution (from start) pH of solution will be finally:

A. 5

B. 7

C. 9

D. 11

Answer: c

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535. Successive dissociation constants of H_2CO_3 are $K_{a_1} = 10^{-3}$ and $K_{a_2} = 10^{-6}$. An aqueous solution contains $0.1 M H_2CO_3$ and $0.1 M HCI$ at $25^\circ C$

The concentration of CO_3^{2-} at equilibrium in solution is: (approximately)

A. $10^{-6} M$

B. $10^{-12} M$

C. $10^{-10} M$

D. $10^{-8} M$

Answer: d

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536. Successive dissociation constants of H_2CO_3 are $K_{a_1} = 10^{-3}$ and $K_{a_2} = 10^{-6}$. An aqueous solution contains $0.1 M H_2CO_3$ and $0.1 M HCI$ at $25 ^\circ C$

If solution contains only $0.1 M H_2CO_3$ then the concentration of CO_3^{2-} at equilibrium in the solution will be :

A. $10^{-6} M$

B. $10^{-12} M$

C. $10^{-9} M$

D. $10^{-12} M$

Answer: a

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537. 1 litre of $1MCH_3COOH$ (very weak acid) taken in a container initially. Now this solution is diluted upto volumen V (litre) so that pH of the resulting solution becomes twice the original value. $\left(K_a\left(CH_3COOH\right) = 10^{-6}\right)$. Now equal volume of $0.5 \times 10^{-6}MNaOH$ solution is added to this resulting solution, so that a buffer solution is obtained.

Find $\left[H^+\right]$ in original solution

A. $1M$

B. $10^{-3}M$

C. $10^{-7}M$

D. $10^{-11}M$

Answer: b

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A. 5×10^5 litre

B. 1 litre

C. 2 litre

D. 2×10^{-6} litre

Answer: a

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539. 1 litre of $1MCH_3COOH$ (very weak acid) taken in a container initially. Now this solution is diluted upto volumen V (litre) so that pH of the resulting solution becomes twice the original value. $\left(K_a\left(CH_3COOH\right) = 10^{-6}\right)$. Now equal volume of $0.5 \times 10^{-6}MNaOH$ solution is added to this resulting solution, so that a buffer solution is obtained.

Find pH of final solution (log $3 = 0.477$).

A. 6

B. 6.477

C. 5.523

D. 3

Answer: c

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540. Refer to an aqueous solution of formic acid, $HCOOH$, which has a K_a value of 1.9×10^{-4} at $25^{\circ} C$.

What is the percent ionization of a $0.10M$ solution of formic acid at $25^{\circ} C$

A. 0.19%

B. 1.4%

C. 4.4%

D. 14%

Answer: c

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541. Refer to an aqueous solution of formic acid, $HCOOH$, which has a K_a value of 1.9×10^{-4} at $25^\circ C$.

How many moles of sodium formate must be added to $1.0L$ of a $0.20M$ formic acid solution to produce a pH of 4.00 ?

A. 0.38

B. 0.80

C. 1.9

D. 3.8

Answer: a

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542. (Use log $1.8 = 0.26$, K_a of formic acid $= 1.8 \times 10^{-4}$, K_a of acetic acid $= 18 \times 10^{-5}$, K_b of ammonia $= 1.8 \times 10^{-5}$, K_{a_1} of $H_2S = 10^{-7}$ and K_{a_2} of $H_2S = 10^{-14}$, for the following matchings) Match the entries of column II for which the equality of inequality given in the column II are satisfied.

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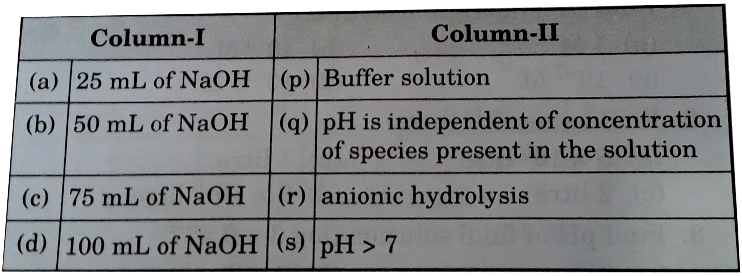
543. Match the effect of addition of $1MNaOH$ to $50mL$ of $1MH_2C_2OH$ (diprotic acid) in column I with column II (Given : $K_{a_1} = 10^{-4}, K_{a_2} = 10^{-9}\Big)$:



Column-I		Column-II	
(a)	25 mL of NaOH	(p)	Buffer solution
(b)	50 mL of NaOH	(q)	pH is independent of concentration of species present in the solution
(c)	75 mL of NaOH	(r)	anionic hydrolysis
(d)	100 mL of NaOH	(s)	pH > 7

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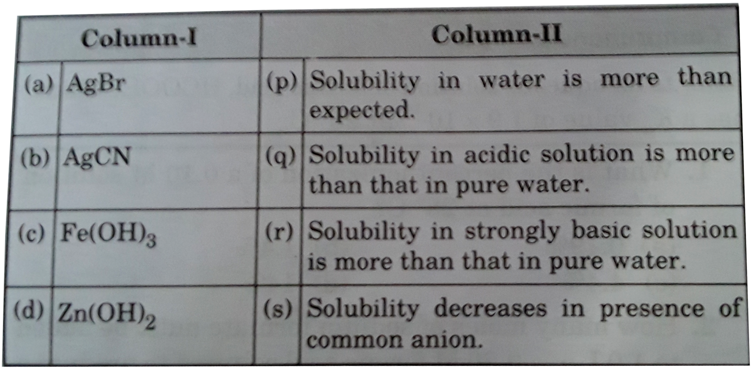

Column-I		Column-II	
(a)	AgBr	(p)	Solubility in water is more than expected.
(b)	AgCN	(q)	Solubility in acidic solution is more than that in pure water.
(c)	$Fe(OH)_3$	(r)	Solubility in strongly basic solution is more than that in pure water.
(d)	$Zn(OH)_2$	(s)	Solubility decreases in presence of common anion.

544.

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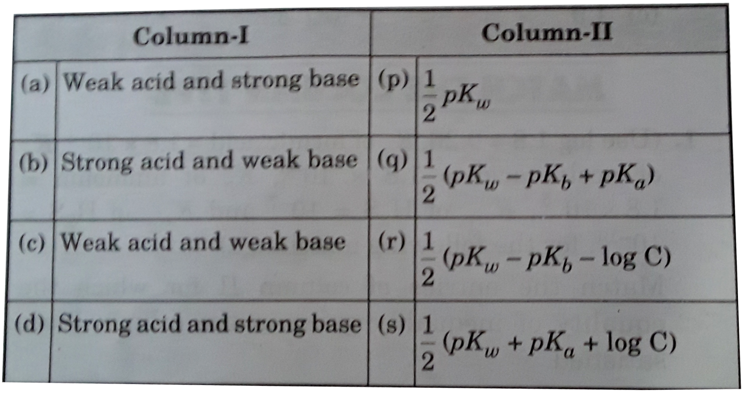
545. Match column-I (Solution of salts of salts of...) with column-II (pH of the solution is given by):



Column-I		Column-II	
(a)	Weak acid and strong base	(p)	$\frac{1}{2}pK_w$
(b)	Strong acid and weak base	(q)	$\frac{1}{2}(pK_w - pK_b + pK_a)$
(c)	Weak acid and weak base	(r)	$\frac{1}{2}(pK_w - pK_b - \log C)$
(d)	Strong acid and strong base	(s)	$\frac{1}{2}(pK_w + pK_a + \log C)$

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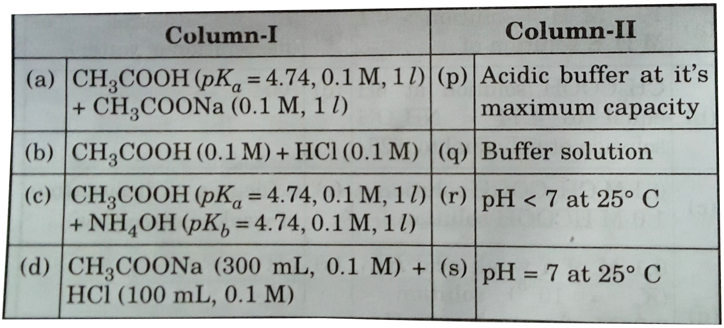
546. Match the following columns



Column-I		Column-II	
(a)	CH_3COOH ($pK_a = 4.74$, 0.1 M, 1 l) + CH_3COONa (0.1 M, 1 l)	(p)	Acidic buffer at it's maximum capacity
(b)	CH_3COOH (0.1 M) + HCl (0.1 M)	(q)	Buffer solution
(c)	CH_3COOH ($pK_a = 4.74$, 0.1 M, 1 l) + NH_4OH ($pK_b = 4.74$, 0.1 M, 1 l)	(r)	pH < 7 at 25° C
(d)	CH_3COONa (300 mL, 0.1 M) + HCl (100 mL, 0.1 M)	(s)	pH = 7 at 25° C

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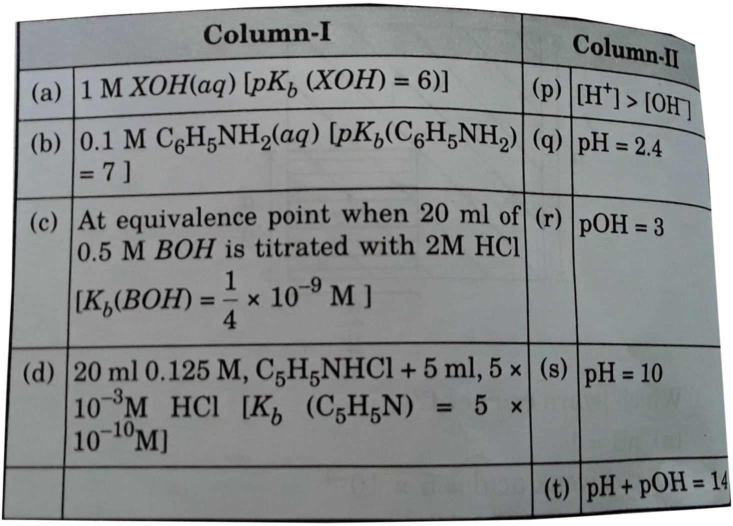
547. Note : $\log 2 = 0.3$: All data are at $25^\circ C$



	Column-I		Column-II
(a)	1 M $XOH(aq)$ [pK_b (XOH) = 6)]	(p)	$[H^+] > [OH^-]$
(b)	0.1 M $C_6H_5NH_2(aq)$ [$pK_b(C_6H_5NH_2)$ = 7]	(q)	pH = 2.4
(c)	At equivalence point when 20 ml of 0.5 M BOH is titrated with 2M HCl [$K_b(BOH) = \frac{1}{4} \times 10^{-9}$ M]	(r)	pOH = 3
(d)	20 ml 0.125 M, C_5H_5NHCl + 5 ml, 5×10^{-3} M HCl [K_b (C_5H_5N) = 5×10^{-10} M]	(s)	pH = 10
		(t)	pH + pOH = 14

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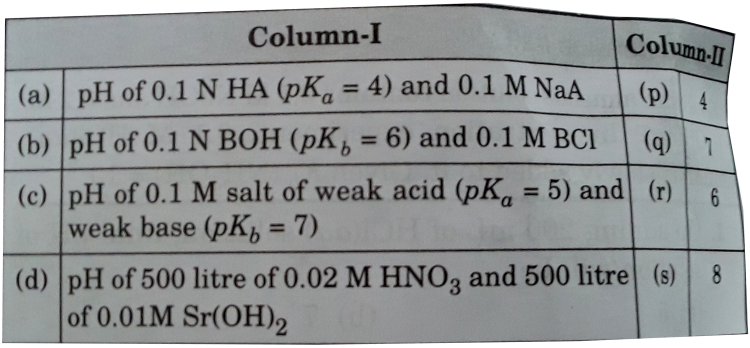
548. Match the following columns



	Column-I	Column-II	
(a)	pH of 0.1 N HA ($pK_a = 4$) and 0.1 M NaA	(p)	4
(b)	pH of 0.1 N BOH ($pK_b = 6$) and 0.1 M BCl	(q)	7
(c)	pH of 0.1 M salt of weak acid ($pK_a = 5$) and weak base ($pK_b = 7$)	(r)	6
(d)	pH of 500 litre of 0.02 M HNO_3 and 500 litre of 0.01M $Sr(OH)_2$	(s)	8

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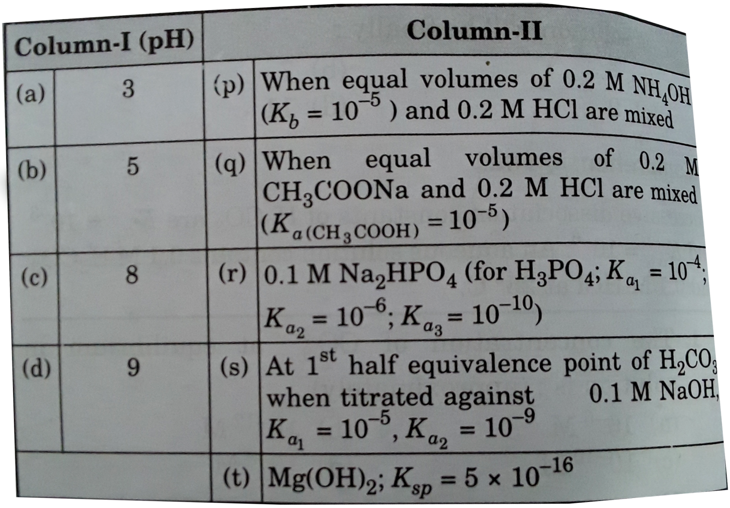
549.



Column-I (pH)		Column-II	
(a)	3	(p)	When equal volumes of 0.2 M NH_4OH ($K_b = 10^{-5}$) and 0.2 M HCl are mixed
(b)	5	(q)	When equal volumes of 0.2 M CH_3COONa and 0.2 M HCl are mixed ($K_{a(CH_3COOH)} = 10^{-5}$)
(c)	8	(r)	0.1 M Na_2HPO_4 (for H_3PO_4; $K_{a_1} = 10^{-4}$; $K_{a_2} = 10^{-6}$; $K_{a_3} = 10^{-10}$)
(d)	9	(s)	At 1st half equivalence point of H_2CO_3 when titrated against 0.1 M NaOH, $K_{a_1} = 10^{-5}$, $K_{a_2} = 10^{-9}$
		(t)	$Mg(OH)_2$; $K_{sp} = 5 \times 10^{-16}$

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550. How much water (in ml) must be added to 300 mL of a 0.2 M solution of CH_3COOH for the degree of dissociation of the acid to double ? [Assume K_a of acetic acid is of the order of $10^{-5}M$]

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551. In the titration of a solution of a weak base BOH with HCl has pH is 8.2 after $10ml$ of HCl solution has been added and 7.6 after 20 ml of HCl solution has been added. Calculate the value of pK_b of the base and express your answer as ab.cd [For example if your answer is 3.8 then write answer as 0380]

[Given : log $2 = 0.3$]

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552. The acidic strength of two monobasic acids may be compared by comparing the hydronium ion concentrations of their aqueous solution of same molar concentration. The dissociation constants of acids HA and HB are 4×10^{-6} and 2.5×10^{-9}, respectively. How many times HA is stronger than HB ? Assume that for both the acids, the degree of dissociation at the concentration take, is negligible.

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553. The dissociation constant of a substituted benzoic acid at $25\,^{\circ}C$ is 1.0×10^{-4}. The pH of $0.01M$ solution of its salt is :

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554. Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is:

KCN K_2SO_4 $\left(NH_4\right)_2C_2O_4$ $NaCI$

$ZN\left(NO_3\right)_2$ $FeCI_3$ K_2CO_3 NH_4NO_3

$LiCN$

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555. In 1L saturated solution of $AgCI\left[K_{sp}(AgCI) = 1.6 \times 10^{-10}\right]$, $0.1mol$ of $CuCI\left[K_{sp}(CuCI) = 1.0 \times 10^{-6}\right]$ is added. The resultant concentration of Ag^+ in the solution is 1.6×10^{-x}. The value of "x" is.

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556. Consider a solution of monoprotic weak acid having dissociation constant K_a. What is the minimum value of concentration of the undissociated acid can be equated to C within a 10% limit of error. Assume that activity coefficient corrections are negligible.

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557. What volume (inml) of $0.10M$ sodium formate solution should be added to $50ml$ of $0.05M$ formic acid to produce a buffer solution of $pH4$. $\left[pK_a\right.$ for formic acid is 3.7]

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558. The K_{sp} of $Ca(OH)_2$ is 4.42×10^{-5} at $25\,^\circ C$. A 500 ml of saturated solution of $Ca(OH)_2$ is mixed with an equal volume of $0.4 M NaOH$. How much $Ca(OH)_2$ in mg is precipitated ?

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559. If a solution is $0.1M$ with respect to H_2S and $0.5M$ with respect to HCl then the concetration of $\left[S^{2-}\right]$ in the solution is $x \times 10^{-22}M$.Find the value of x.

Given : $\left.\begin{matrix} K_{a_1} = 10^{-7} \\ K_{a_2} = 10^{-14} \end{matrix}\right] H_2S$

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560. What volume of concentrated HCl (in ml) that is $36.5\% HCI$ by mass, and has a density $1.25 gcm^{-3}$ is required to produce $2.5L$ of solution of $pH = 1$.

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561. In a solution of $0.04 MFeCI_2$, $0.02 MFeCI_3$ and $0.01 M - HCI$ how, large may be its pH without there being precipitation of either $Fe(OH)_2$ or $Fe(OH)_3$? K_{sp} are 8×10^{-16} for $Fe(OH)_2$ and 4×10^{-28} for $Fe(OH)_3$. (Given your answer excluding the decimal places).

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562. A sample of hard water contains 0.005 mole of $CaCI_2$ per litre. What is the minimum concentration of Na_2SO_4 (in mole/L) which must be exceeded for removing Ca^+ ions from this water sample ? The solubility product of $CaSO_4$ at $25\,^\circ C$ is 2.4×10^{-5}. (Given your answer after multiplying with 10000 and excluding and decimal places)

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563. How many millimoles of $MgCI_2$ should be added to just precipitate $Mg(OH)$ in 500 ml buffer solution containing $0.1MNH_4OH$ and $0.1M\left(NH_4\right)_2SO_4$? {Given : $K_b\left(NH_4OH\right) = 10^{-5}, K_{sp}\left[Mg(OH)_2\right] = 10^{-11}\}$

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564. $1.0L$ of solution which was in equilibrium with solid mixture of $AgCI$ and Ag_2CrO_4 was found to contain 1×10^{-4} moles of Ag^+ ions, 1.0×10^{-6}moles of CI^- ions and 8.0×10^{-4} moles of CrO_4^{2-} ions. At constant volume, Ag^+ ions are added slowly to the above mixture till 8.0×10^{-7} moles of $AgCI$ got precipitated. How many moles of Ag_2CrO_4 were also precipitated ? Given your answer after multiplying with 10^6.

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565. $50ml$ of a solution which is $0.05M$ in the acid $HA\left(pK_a = 3.80\right)$ and $0.1M$ in $HB\left(pK_a = 8.20\right)$ is titrated with $0.2M$ - $NaOH$ solution. Calculate the pH of solution at the first equivalence point. Given your answer after multiplying with 100.

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566. Calculate pH when 100ml of $0.1 MNaOh$ is reacted with $100 ml$ of $0.2 MCH_3COOH$. $\left(K_a = 10^{-5}\right)$

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567. $10 ml$ of $0.1 M$ weak acid $HA\left(K_a = 10^{-5}\right)$ is mixed with 10 ml $0.2 MHCI$ and $10 ml 0.1 MNaOH$. Find the concentration of A^- in the resulting solution. Write your answer as $\left(-\log\left[A^-\right]\right)$

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568. Calculate the pH when equal volume of $0.01MHA\left(K_a = 10^{-6}\right)$ and $10^{-3}MHB\left(K_a = 10^{-5}\right)$ are mixed.

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569. Calculate solubility of $Ca_3\left(PO_4\right)_2\left(K_{sp} = 10^{-15}\right)$ in presence of $0.1MCaCI_2$ solution. If your answer is $x \times 10^{-y}$ where x is single digit then fill $y - x$ in OMR sheet, e.g., if answer is 2×10^{-3} then answer is 1.

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570. How much water (in L) should be added to 10g CH_3COOH to given pOH equal to 11. $K_a\left(CH_3COOH\right) = 1.8 \times 10^{-5}$

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571. Calculate the pH at which the following reaction will be at equilibrium in basic medium :

$A_2(s) \Leftrightarrow A^-(aq) + AO_3^-(aq)$

When the equilibrium concentration at 300 K are:

$\left[A^-\right] = 0.1M, \left[AO_3^-\right] = 0.1M$

Given: ΔG_f° of $OH^-(aq) = -150kJ/\text{mole}$,

$\Delta G_f^\circ \text{ of} H_2O(l) = -233kJ/\text{mole}$

$\Delta G_f^\circ \text{ of} A^-(aq) = -50kJ/\text{mole}$,

$\Delta G_f^\circ \text{ of} AO_3^-(aq) = -123.5kJ/\text{mole}$,

$R = \frac{25}{3}J\text{mole}^{-1}K^{-1}, \log_e 10 = 2.3$

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572. A sparingly soluble salt gets precipitated only when the product of concentration of its ions in the solution $\left(Q_{sp}\right)$ becomes greater than its solubility product. If the solubility of $BaSO_4$ in water is 8×10^{-4} mol dm^{-3}. Calculate its solubility in 0.01 mol dm^{-3} of H_2SO_4. Express your answer in scientific notation $x \times 10^{-y}$. Write the value of y.

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573. Calculate the volume of water required to dissolve$0.1g$ lead (II) chloride to get a saturaed solution $\left(K_{sp}\right.$ of $PbCI_2 = 3.2 \times 10^{-8}$, atomic mass of $Pb = 207u$). Multiply your answer with 10 to get answer.

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574. The solubility product of $AI(OH)_3$ is 2.7×10^{-11}. Calculate its solubility in mgL^{-1}. (Atomic mass of $AI = 27u$).

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575. Find the number of aqueous solution which turn litmus paper blue.

(a) NH_4OH (b) $NaOH$

(c) NH_4CI (d) CH_3COONa

(e) $NaHSO_4$ (f) HCI

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576. At 298 K pure T_2O has pT (like pH) is 7.60. Find out the pT of a solution prepared by adding $10ml$ of $0.2MTCl$ to $15ml$ of

$0.20MNaOT$. (Given: log 2 = 0.30) Multiply your answer with 10 to get answer.

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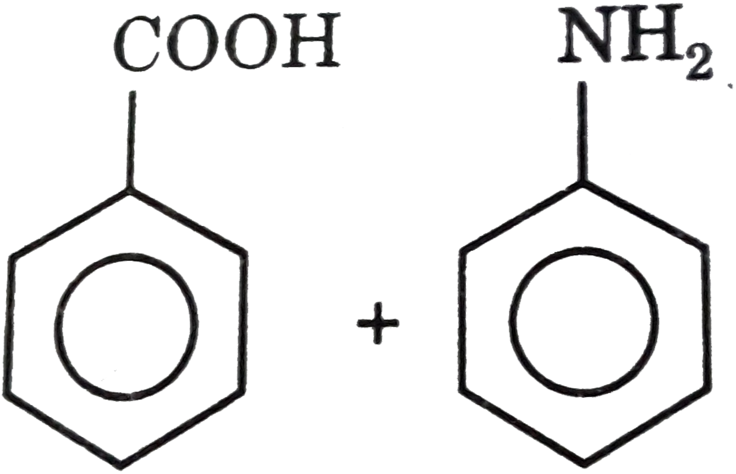
577. Count the number of pairs which may act as a buffer solution when present in a given solution

(a) $CH_3COOH + NaOH$ (b)



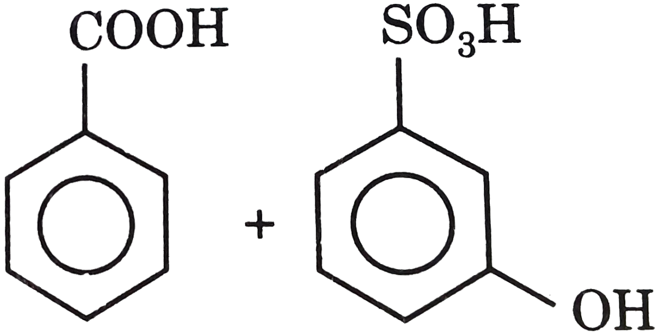
(c) $NH_4CI + HNO_3$ (d) $HCIO_4 + KCIO_4$

(e) $H_3PO_4 + NaOH$ (f) $H_3PO_3 + NaOH$

(g) $NaHCO_3 + Na_2CO_3$ (h) $H_2SO_4 + Na_2SO_4$

(i) $CH_3COONa + HCI$

(j)



(j)

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578. Quinine is an alkaloid, or naturally occuring base, used to treat malaria. $A0.05M$ solution of quinine has a pH of 9.70 at $25^{\circ} C/$ The basicity of alkaloids is due to a nitrogen atom that picks up protons from water in the same manner as ammonia does. The K_b of quinine is $(x.y) \times 10^{-ab}$. The value of 'xyab' is: [Given : log 2 = 0.3]

[For example: If K_b is 4.2×10^{-07}, then answer is 4207]

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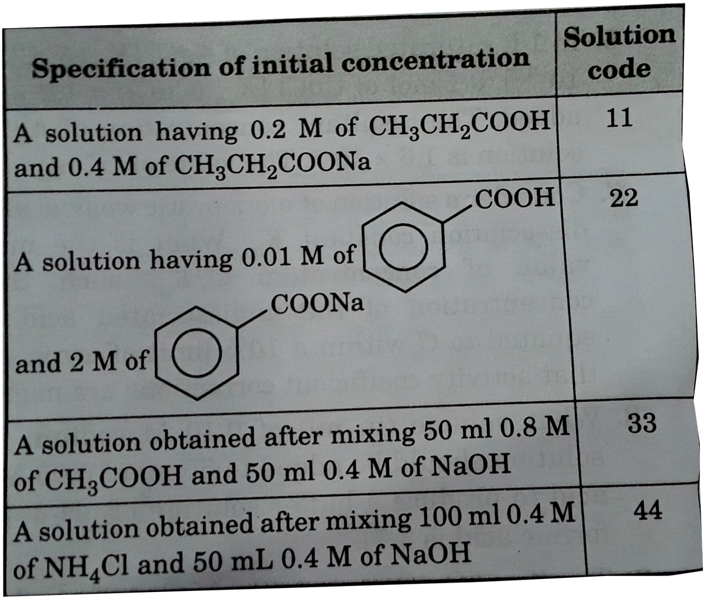
579. Some solutions are taken at specified concentration and have the following solution codes. Identify the four digit number abcd where ab = Sum of solution codes of those solutions, which will have a singificant buffer action. Cd = Sum of solution codes of those solutions, which for the given amount of acid or base and salt, have maximum buffer capacity.



Specification of initial concentration	Solution code
A solution having 0.2 M of CH_3CH_2COOH and 0.4 M of CH_3CH_2COONa	11
A solution having 0.01 M of COOH and 2 M of COONa	22
A solution obtained after mixing 50 ml 0.8 M of CH_3COOH and 50 ml 0.4 M of NaOH	33
A solution obtained after mixing 100 ml 0.4 M of NH_4Cl and 50 mL 0.4 M of NaOH	44

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580. How many of the following may act as buffer ?

(a) $20mL0.2M$ - H_2CO_3 solution $+10ml0.2M$ - $NaOH$ solution

(b) $20ml0.2M$ - H_2CO_3 solution $+20ml0.2M$ - $NaOH$ solution

(c) $20mL0.2M$ - H_2CO_3 solution $+30mL0.2M$ - $NaOH$ solution

(d) $20mL0.2M - H_2CO_3$ solution $+10mL0.2M - NaHCO_3$ solution

(e) $20mL0.2M - H_2CO_3$ solution $+10mL0.2M - Na_2CO_3$ solution

(f) $20mL0.2M - H_2CO_3$ solution $+20mL0.2M - Na_2CO_3$ solution

(g) $20mL0.2M - H_2CO_3$ solution $+30ml0.2M - Na_2CO_3$ solution

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581. What concentartion of Ac^- ions will reduce H_3O^+ ion to $2 \times 10^{-4}M$ in $0.40M$ solution of HAc? $\left[K_a(HAc) = 1.8 \times 10^{-5}\right]$

Given your answer after multiplying by 1000.

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582. If after addition of 'V' litres of water in 1 litre solution of $2.5 \times 10^{-3} M Ba(OH)_2$, pOH of solution becomes 3 times, and if V is expressed in scietific notattion as $x \times 10^{y}$ then calculate value of y.

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583. $3.8 gm$ of a tribasic carboxylic acid derivative of a saturated hydrocarbon required 100 ml of $0.6 M NaOH$ solution to reach equivalence point. Calculate molar mass of tribasic carboxylic acid derivative of saturated hydrocarbon.

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584. 6 gm of CH_3COOH, 6gm of $NaOH$ and 6.3gm of HNO_3 are dissolved in 1L of water. If K_a of CH_3COOH is 10^{-5} then calculate pH of resulting solution.

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585. Equal volume of $0.1MH_2CO_3\left(K_{a_1} = 10^{-7}, K_{a_2} = 10^{-11}\right)$ and $0.1MH_2S\left(K_{a_1} = 10^{-7}, K_{a_2} = 10^{-14}\right)$ are mixed together. Calculate value of $pOH - pH$ for resulting solution.

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586. Number of statement(s) that is/are correct :

(a) On increasing temperature, pH of pure water decreases

On increasing temperature, pOH of pure water decreases

(c) On increasing dilution, dissociation of weak electrolyte increases

(d) pH of $10^{-7} M NaOH(aq)$ is 7 at $25^{\circ} C$.

(e) At equivalence point (during titration of acid ad base) solution must be neutral.

(f) Generally, pH of buffer solution does not change on dilution.

(g) pH of salt of weak acid and weak base depends on concentration of salt.

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587. An acidic aqueous solution contains $0.02M - FeCI_2$ and $0.05M - FeCI_3$, at $25^{\circ} C$. Now $NaOH$ solution is added is this solution, drop bydrop. The pH range in which only the precipitation of $Fe(OH)(s)$ occur without precipitation of $Fe(OH)_2(s)$ differs by 'x' unit. The value of 'x' is given :

K_{sp} of $Fe(OH)_2 = 8 \times 10^{-16}$

K_{sp} of $Fe(OH)_3 = 4 \times 10^{-28}$

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588. Calculate the minimum mass of $AB_2(s)$ which must be added to 100 mL water (in mg) to form a saturated solution.

$K_{sp}\left(AB_2\right) = 3.2 \times 10^{-11}$

$M_{w.t}\left[AB_2(s)\right] = 100g/\text{mole}$

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