CHEMISTRY

BOOKS - SAI CHEMISTRY (TELUGU ENGLISH)

CHEMICAL EQUILIBRIUM AND ACIDES-BASES

Mcq

1. On increasing temperature, the equilibrium constant of exothermic and endothermic reactions, respectively

A. Increases and decreases

B. Decreases and increases

C. Increases and increases

D. Decreases and decreases

Answer: B

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2. What is the pH of the NaOH solution when 0.04 g of it is dissolved in water and made to 100 ml solution?

A. 2

B. 1

C. 13

D. 12

Answer: D

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3. When one mole of A and one mole of B were heated in a one litre flask at T(K), 0.5 moles of C were formed at equilibrium

$A + B \Leftrightarrow C + D$

The equilibrium constant K_C is

A. 0.25

B. 0.5

C. 1

D. 2

Answer: C

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4. If the solubility of $Ca_3(PO_4)_2$ in water is 'X' mol L_{-1}, its solubility product in $mol^5 L^{-5}$ is

A. $6X^5$

B. $36X^5$

C. $64X^5$

D. $108X^5$

Answer: D

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5. In a reaction, $A + B \Leftrightarrow C + D$ 40% of B has reacted at equilibrium, when 1 mole of A was heated with 1 mole of B in a 10 L closed vessel. The value of K_C is

A. 0.44

B. 0.18

C. 0.22

D. 0.36

Answer: A

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6. If the ionic product of $Ni(OH)_2 is 1.9 \times 10^{-15}$, the molar solubility of $Ni(OH)_2$, in 1.0 M NAOH is

A. 1.9×10^{-18} M

B. 1.9×10^{-13} M

C. 1.9×10^{-15} M

D. 1.9×10^{-14} M

Answer: C

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7. The degree of ionization of 0.10 M lactic acid is 4.0%

The value of K_C is

A. 1.66×10^{-5}

B. 1.66×10^{-4}

C. 1.66×10^{-3}

D. 1.66×10^{-2}

Answer: B

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8. The pH of a buffer solution made by mixing 25 mL of 0.02 M NH_4OH and 25 mL of 0.2 M NH_4CI at 25° is ($p^{K_b} of NH_4OH = 4.8$)

A. 5.8

B. 8.2

C. 4.8

D. 3.8

Answer: B

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9. The pK_a values of four carboxylic acids are given below.

Identify the weakest carboxylic acid.

A. 4.89

B. 1.28

C. 4.76

D. 2.56

Answer: A

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10. Which one of the following statements is not correct?

A. The pH of 1.0×10^{-8} M HCl is less than 7

B. The ionic product of water at $25^{\circ}C$ is $1.0 \times 10^{-14} mol^2 L^{-2}$

C. Cl^- is Lewis acid

D. Bronsted Lowry theory cannot explain the acidic character of $AlCl_3$

Answer: C

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11. If the equilibrium constant for the reaction $2AB \Leftrightarrow A_2 + B_2$ is 49 what is the value of equilibrium constant for $AB \Leftrightarrow \frac{1}{2}A_2 + \frac{1}{2}B_2$?

A. 7

B. $\frac{1}{7}$

C. 24.5

D. 49

Answer: A

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12. The pH of 0.05 M acetic acid is $\left(K_a = 2 \times 10^{-5}\right)$

A. 2

B. 11

C. 10^{-3}

D. 3

Answer: D

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13. If the equilibrium constant for the reaction,

$H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is K

What is the equilibrium constant of $HI(g) \rightarrow \frac{1}{2}H_2(g) + \frac{1}{2}I_2(g)$?

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

B. $\sqrt{K}$

C. K

D. $\frac{1}{\sqrt{K}}$

Answer: D

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14. The pH of 0.01 M solution of acetic acid is 5.0. What are the values of $\left[H^{+}\right]$ and K_a respectively?

A. $1 \times 10^{-5} M, 1 \times 10^{-8}$

B. $1 \times 10^{-5} M, 1 \times 10^{-9}$

C. $1 \times 10^{-4} M, 1 \times 10^{-8}$

D. $1 \times 10^{-3} M, 1 \times 10^{-8}$

Answer: A

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15. pH of a buffer solution decreases by 0.02 units when 0.12 g of acetic acid is added to 250 mL of a buffer solution of acetic acid and potassium acetate at $27^{\circ}C$. The buffer capacity of the solution is

A. 0.1

B. 10

C. 1

D. 0.4

Answer: D

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16. The equilibrium constant for the given reaction is 100.

$N_2(g) + 2O_2(g) \Leftrightarrow 2NO_2(g)$ What is the equilibrium constant for the reaction given below?

$$NO_2(g) \Leftrightarrow \frac{1}{2}N_2(g) + O_2$$

A. 10

B. 1

C. 0.1

D. 0.01

Answer: C

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17. 20 mL of 0.1 M acetic acid is mixed with 50 mL of potassium acetate. K_a of acetic acid = 1.8×10^{-5} at $27^\circ C$. Calculate concentration

of potassium acetate if pH of the mixture is 4.8.

A. 0.1M

B. 0.04M

C. 0.4M

D. 0.02M

Answer: B

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18. 50 ml of H_2O is added to 1×10^{-3}M barium hydroxide solution. What is the pH of the resulting solution?

A. 3

B. 3.3

C. 11

D. 11.7

Answer: C

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19. Assertion (A): The aqueous solution of CH_3COONa is alkaline in nature.

Reason (R): Acetate ion undergoes anionic hydrolysis.

The correct answer is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) is not the correct explanation of (A)

C. (A) is the true but (R) is not true

D. (A) is not true but (R) is true

Answer: A

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20. In a 500 mL flask, the degree of dissociation of PCI_5 at equilibrium is 40% and the initial amount is 5 moles. The value of equilibrium constant in $molL^{-1}$ for the decomposition of PCI_5 is

A. 2.33

B. 2.66

C. 5.32

D. 4.66

Answer: B

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21. Which of the following is not a conjugate acid base pair?

A. HPO_3^{2-}, PO^{3-} _ (3)

B. $H_2PO_4^-$, HPO_4^{2-}

C. $H_2PO_4^-$, H_3PO_4

D. $H_2PO_4^-$, PO_3^{3-}

Answer: D

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22. Which of the following salts gives an acidic solution in water?

A. CH_3COONa

B. NH_4Cl

C. NaCl

D. CH_3COONH_4

Answer: B

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23. The equilibrium constant of the reaction, $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow 2SO_3(g)$ is $5 \times 10^{-2} atm$. The equilibrium constant of the reaction, $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$

A. 100 atm

B. 200 atm

C. $4 \times 10^2 atm$

D. $6.25 \times 10^4 atm$

Answer: C

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24. At T(K), 100 L of dry oxygen is present in a sealed container. It is subjected to silent electrical discharge till the volumes of oxygen

and ozone become equal What is the volume (in L) of ozone formed at T(K)?

A. 50

B. 60

C. 30

D. 40

Answer: D

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25. Which of the following is not a characteristic property of chemical equilibrium?

A. Rate of forward reaction is equal to rate of backward reaction at equilibrium

B. After reaching the chemical equilibrium, the concentrations of reactants and products remain unchanged with time

C. For $A(g) = B(g), K_C$ is 10^{-2}, if this reaction is carried out in the presence of

catalyst, the value of K_C decreases

D. After reaching the equilibrium, both forward and backward reactions continue to take place.

Answer: C

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26. The concentration of oxalic acid is 'x' mol L^{-1} 40 mL of this solution reacts with 16 mL of 0.05M acidified KMNO4. What is the pH of 'x'

M oxalic acid solution?

(Assume that oxalic acid dissociates completely.)

A. 1.3

B. 1.699

C. 1

D. 2

Answer: A

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27. Assertion (A): The pH of a buffer solution containing equal moles of acetic acid and sodium acetate is 4.8 (pK_a of acetic acid is 4.8).

Reasons (R): The ionic product of water at $25^\circ Cis10^{-14}mol^2L^{-2}$.

The correct answer is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is not true

D. (A) is not true but (R) is true

Answer: B

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28. At 550 K, the K for the following reaction is $10^4 molL^{-1}$.

$X(g) + Y(g) \Leftrightarrow Z(g)$ At equilibrium, it was observed that $[X] = \frac{1}{2}[Y] = \frac{1}{2}[Z]$What is the value of [Z] (in $molL^{-1}$) at equilibrium?

A. 2×10^{-4}

B. 10^{-4}

C. 2×10^{4}

D. 10^{4}

Answer: A

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29. The pH of a solution of H_2O_2 is 6.0. Some chlorine gas is bubbled into this solution. Which of the following is correct?

A. The pH of resulting solution becomes 8.0

B. Hydrogen gas is liberated from resultant solution

C. The pH of resultant solution becomes less than 6.0 and oxygen gas is liberated

D. Cl_2O is formed in the resultant solution

Answer: C

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30. In which of the following reactions, the concentration of product is higher than the concentration of reactant at equilibrium? (K = equilibrium constant)

A. $A \Leftrightarrow B, K = 0.001$

B. $M \Leftrightarrow N, K = 10$

C. $X \Leftrightarrow Y, K = 0.005$

D. $R \Leftrightarrow P, K = 0.01$

Answer: B

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31. Study the following table

Which of the two sets of buffer solutions have least pH?

A. I and II

B. I and III

C. II and III

D. II and IV

Answer: B

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32. Consider the following reaction equilibrium

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3$

Initially, 1 mole of N_2 and 3 moles of H_2 are taken in a 2 2L flask. At equilibrium state, if the number of moles of N_2 is 0.6, what is the total number of moles of all gases present in the flask?

A. 0.8

B. 1.6

C. 3.2

D. 6.4

Answer: C

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33. If the ionic product of water $(K_w) is 1.96 \times 10^{-14} at 35^\circ C$ what is its value at $10^\circ C$?

A. 1.96×10^{-14}

B. 3.92×10^{-14}

C. 2.95×10^{-15}

D. 1.96×10^{-13}

Answer: C

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34. 75 mL of 0.2 M HCl is mixed with 25 mL of 1 M HCl. To this solution, 300 mL of distilled

water is added. What is the pH of the resultant solution?

A. 1

B. 2

C. 4

D. 0.2

Answer: A

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35. Which one of the following statements is correct?

A. Bronsted-Lowry theory could not explain the acidic nature of BCl_3

B. The pH of 0.01 M NaOH solution is 2

C. The ionic product of water at $25^\circ Cis10^{-10}mol^2L^{-2}$

D. The pH of a solution can be calculated using the equation, $pH = -\log\left[H^+\right]$

Answer: A

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36. 250 mL of a sodium carbonate solution contains 2.65 g Na_2CO_3. If 10 mL of this solution is diluted to one litre, what is the concentration of resultant solution?

A. 0.1 M

B. 0.001 M

C. 0.01 M

D. $10^{-4}M$

Answer: B

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37. The pK_a of a weak acid is 4,8. What should be the ratio $\frac{Acid}{Salt}$ if a buffer of pH= 5.8 is required?

A. 0.1

B. 10

C. 1

D. 2

Answer: A

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38. Which of the following would produce a buffer solution when mixed in equal volumes?

A. $1MCH_3COOH$ and $0.5MNaOH$

B. $1MCH_3COOH$ and $0.5MHCl$

C. $1MNH_4OH$ and $0.5MNaOH$

D. $1MNH_4OH$ and $0.5MHCl$

Answer: A

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39. The equilibrium constant for the reaction, $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is 64 at a certain temperature. The equilibrium concentrations of H_2 and HI are $2mol/L$ and $16mol/L$

respectively. What is the equilibrium concentration (in mol/L) of I_2 ?

A. 16

B. 4

C. 8

D. 2

Answer: D

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40. Which of the following is correct for acid buiter? [salt = S, acid = A]

A. $pK_a = pH + \log\frac{S}{A}$

B. $pH = pK_a + \log\frac{S}{A}$

C. $pK_a = pH - \frac{A}{S}$

D. $pH = pK_a + \log\frac{A}{S}$

Answer: B

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41. The pH of an aqueous solution of a salt is

10. The salt

A. NaCl

B. NH_4CI

C. CH_3COON

D. $(NH_4)_2SO_4$

Answer: C

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42. The following reaction is known to occur in the body, If CO_2 escapes from the system

$$CO_2 + H_2O \Leftrightarrow H_2CO_3 \Leftrightarrow H^+ + HCO_3^-$$

A. H^+ ion concentration increases

B. H^+ ion concentration decreases

C. H_2CO_3 concentration does not change

D. The forward reaction will be promoted

Answer: B

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43. Δx = (hydration energy)- (lattice energy), for a salt Δx is found to be -500 kcal mol^{-1} Then, on increasing the temperature, its solubility in water

A. Increases

B. Decreases

C. Remains same

D. Increase initially and then decreases

Answer: A

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44. The pH of 1 L solution is 2. It is diluted with water till its becomes 4. How many litres of water are added?

A. 99

B. 9

C. 999

D. 9.9

Answer: A

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45. At $90^\circ C$, the concentration of H_3O^+ inpure water is $10^{-6} molL^{-1}$. What is the value of K_w at this temperature?

A. 10^{-6}

B. 10^{-8}

C. 10^{-14}

D. 10^{-12}

Answer: D

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46. The pH of a solution is increased from 3 to 6. Its H'ion concentration will be

A. Reduced to half

B. Doubled

C. Reduced by 1000 times

D. Increased by 1000 times

Answer: C

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47. The conjugate base of NH_2^- is

A. NH_3

B. NH^{2-}

C. NH_4^+

D. NH_3^-

Answer: B

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48. 4.5 moles, each of hydrogen and iodine was heated in a sealed 10 L vessel. At equilibrium, 3 moles of HI were found. The equilibrium constant for $H_2(g) + I_2(g) \rightarrow 2HI(g)$, is

A. 1

B. 10

C. 5

D. 0.33

Answer: A

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49. Which of the following solutions cannot act as a bufler?

A. $NaH_2PO_4 + H_3PO_4$

B. $CH_3COOH + CH_3COON$

C. $HCI + NH_4CI$

D. $H_3PO_4 + NaHPO_4$

Answer: C

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50. Which of the following is the strongest Lewis acid?

A. BI_3

B. BBr_3

C. BCI_3

D. BF_3

Answer: A

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51. If the equilibrium constant for the reaction $2AB \Leftrightarrow A_2 + B_2$ is 49 what is the value of equilibrium constant for $AB \Leftrightarrow \frac{1}{2}A_2 + \frac{1}{2}B_2$?

A. 49

B. 2401

C. 7

D. 0.02

Answer: C

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52. The value of K_p for the reaction $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g) is 1.2 \times 10^{-2}$ at $1065^\circ C$. The value of K, for this reaction is

A. 1.2×10^{-2}

B. $< 1.2 \times 10^{-2}$

C. 82

D. $> 1.2 \times 10^{-2}$

Answer: B

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53. The pH of the aqueous solution containing 0.49 g H_2SO_4 in one litre is

A. 2

B. 1

C. 1.7

D. 0.3

Answer: A

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54. The conjugate acid of NH_2^- ion is

A. NH_3

B. NH_4^+

C. N_2H_4

D. NH_2OH

Answer: A

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55. Which of the following compounds is Lewis acid?

A. PCI_3

B. BCI_3

C. NCI_3

D. $CHCI_3$

Answer: B

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56. The equilibrium concentration of C_2H_4 in the following gas phase reaction can be increased by

$$C_2H_4(g) + H_2(g) \Leftrightarrow C_2H_6(g), \Delta H = 32.7kcal$$

A. Removal of C_2H_6

B. Removal H_2 of

C. Increase in temperature

D. Increase in pressure

Answer: B

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57. Urine normally has a pH of 6. If a patient eliminates 1.3 L of urine per day, how many moles of H^+ ions does he urinate?

A. 1.3×10^{-3}

B. 1.3×10^{-6}

C. 1.3×10^{-7}

D. 1.3×10^{6}

Answer: B

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58. Which of the following can act both as Bronsted acid and Bronsted base?

$(i) HCO_3^- \ (ii) NH_3 (iii) O^{2-} \ (iv) HCl$

A. (i) and (ii)

B. (ii) and (iii)

C. None of the above

D. All of the above

Answer: A

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59. Which of the following is least likely to act as a Lewis base?

A. PCI_3

B. SCI_2

C. I^-

D. I^+

Answer: D

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60. Which of the following is not a Lewis acid?

A. BF_3

B. $AICI_3$

C. $BeCl_2$

D. $SnCl_2$

Answer: C

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61. The equilibrium constant (K_C) for the reaction $HA + B \Leftrightarrow BH^+ + A$ is 100. If the rate constant for the forward reaction is 10^5, rate constant for the reverse reaction is

A. 10^{-3}

B. 10^{-5}

C. 10^7

D. 10^3

Answer: D

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62. In the equilibrium reaction, A(g) + 2B(g) + (g), the equilibrium constant, K_c is given by the expression

A. $K_c = \frac{[C][D]}{[A][B]}$

B. $K_c = \frac{[C][D]^2}{[A][B]}$

C. $K_c = \frac{[A][B]^2}{[C][D]}$

D. $K_c = \frac{[C][D]}{[A][B]^2}$

Answer: D

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63. The ionic product of water is 10^{-14}. What is the hydrogen ion concentration of a 0.1 M NaOH solution?

A. 10^{-14}

B. 14 M

C. 13 M

D. 10^{-13} M

Answer: D

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64. The pH of a 0.05 M solution of H_2SO_4 is

A. 5

B. 1

C. 3

D. 0.1

Answer: B

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65. The pH of a 0.001 M aqueous solution of sodium hydroxide will be

A. 5

B. 7.5

C. 9

D. 11

Answer: D

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66. The nature of 0.1 M solution of sodium bisulphate is

A. Acidic

B. Basic

C. Neutral

D. Can't predict

Answer: C

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67. The ionic product of water $[H^+][OH^-]$ is

A. 10^{-11}

B. 10^{-12}

C. 10^{-5}

D. 10^{-14}

Answer: D

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68. The solution which tends to keep the concentration of hydrogen ions constant even when small amount of strong acid or strong base are added to them, is known as

A. Acidic solution

B. Alkaline solution

C. Buffer solution

D. Ideal solution

Answer: C

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69. In the reaction $H_2(g) + Cl_2(g) \rightarrow 2HCI(g)$, relation between K_p and K_c is

A. $K_p = K_c$

B. $K_p \neq K_c$

C. $K_p \geq K_c$

D. $K_p < K_c$

Answer: A

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70. If in 100 mL of an aqueous HCI of pH 10, 900 mL of distilled water is added, the pH of the resultant solution will be

A. 1

B. 2

C. 4

D. 7

Answer: B

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71. The degree of dissociation of an acid HA in 0.1 M solution is 0.1%. Its dissociation constant is

A. 1×10^{-3}

B. 1×10^{-7}

C. 1×10^{-10}

D. 1×10^{-14}

Answer: B

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72. The pH of 10^{-2} M NAOH solution is,

A. 2

B. 12

C. 10

D. 4

Answer: B

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73. The solution that is made by mixing appropriate amount of a weak acid and salt is called

A. Basic buffer

B. Acidic buffer

C. Neutral buffer

D. Both (a) and (b)

Answer: B

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74. The pK_a of a certain weak acid is 4.0. What should be the [salt] to [acid] ratio, if we have to prepare a buffer with a pH= 5 using the acid and one of its salts?

A. $4:5$

B. $5:4$

C. $10:1$

D. $1:10$

Answer: C

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75. The conjugate base of HSO_4^- ion is .....

A. H_2SO_4

B. $H_3SO_4^+$

C. SO_4^{2-}

D. O^{2-}

Answer: C

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76. Aqueous solution of $FeCl_3$ is acidic because of

A. Hydrolysis

B. Anionic hydrolysis

C. Cationic hydrolysis

D. Dissociation

Answer: C

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77. 0.1 M HCI solution is diluted by 100 times. The pH of the solution so formed is.....

A. 4

B. 1

C. 2

D. 3

Answer: D

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