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NEET EQUILIBRIUM — PYQS

Max. Marks: 416 **Questions:** 104

Section A (MCQ) — 104 questions

Q.1 At 298 K, a certain buffer solution contains equal concentrations of X^- and HX. K_b for X^- is 10^{-10}. What is the pH of this buffer solution? [NEET (UG) 2026]

(1) 10 (2) 4 (3) 2 (4) 6

Scan or tap for the full solution

Q.2 Given below are certain reactions. Identify the reaction for which $K_p \neq K_c$. [NEET (UG) 2026]

(1) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(2) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

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

(4) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

Scan or tap for the full solution

Q.3 In a qualitative analysis, Bi^{3+} is detected by appearance of precipitate of BiO(OH)(s). Calculate pH when the following equilibrium exists at 298 K : $BiO(OH)(s) \rightleftharpoons BiO^+(aq) + OH^-(aq)$, $K = 4 \times 10^{-10}$

(Given : log 2 = 0.3010) [NEET (UG) 2026]

(1) 4.699 (2) 5.286 (3) 8.714 (4) 9.301

Scan or tap for the full solution

Q.4 The correct order of solubility of the given salts in water at 298 K is

Salt	K_{sp} at 298 K
AgBr	5.0×10^{-13}
$Zn(OH)_2$	1.0×10^{-15}
Hg_2Cl_2	1.3×10^{-18}

[RE-NEET (UG) 2026]

(1) $Zn(OH)_2 > AgBr > Hg_2Cl_2$

(2) $Hg_2Cl_2 > Zn(OH)_2 > AgBr$

(3) $AgBr > Zn(OH)_2 > Hg_2Cl_2$

(4) $Hg_2Cl_2 > AgBr > Zn(OH)_2$

Solution

Q.5 For the reaction $A(g) \rightleftharpoons 2B(g)$, the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K. [Given : R = 0.0831 L atm mol^{-1} K^{-1}]

K_p for the reaction at 1000 K is [NEET (UG) 2025]

(1) 0.033 (2) 0.021

(3) 83.1 (4) 2.077×10^5

Scan or tap for the full solution

Q.6 Phosphoric acid ionizes in three steps with their ionization constant values K_{a_1}, K_{a_2} and K_{a_3}, respectively, while K is the overall ionization constant. Which of the following statements are true?

A. $\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$

B. H_3PO_4 is a stronger acid than $H_2PO_4^-$ and HPO_4^{2-}

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

D. $K_{a_1} = \frac{K_{a_3} + K_{a_2}}{2}$

Choose the correct answer from the options given below : [NEET (UG) 2025]

(1) B, C and D only (2) A, B and C only

(3) A and B only (4) A and C only

Scan or tap for the full solution

Q.7 Higher yield of NO in $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ can be obtained at [ΔH of the reaction = +180.7 kJ mol^{-1}]

A. Higher temperature

B. Lower temperature

C. Higher concentration of N_2

D. Higher concentration of O_2

Choose the correct answer from the options given below : [NEET (UG) 2025]

(1) B, C, D only (2) A, C, D only

(3) A, D only (4) B, C only

Scan or tap for the full solution

Q.8 In which of the following equilibria, K_p and K_c are NOT equal? [NEET (UG) 2024]

(1) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$

(2) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

(3) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$

(4) $2BrCl_{(g)} \rightleftharpoons Br_{2(g)} + Cl_{2(g)}$

Scan or tap for the full solution

Q.9 For the reaction $2A \rightleftharpoons B + C$, $K_c = 4 \times 10^{-3}$. At a given time, the composition of reaction mixture is: $[A] = [B] = [C] = 2 \times 10^{-3}$ M. Then, which of the following is correct? [NEET (UG) 2024]

(1) Reaction is at equilibrium.

(2) Reaction has a tendency to go in forward direction.

(3) Reaction has a tendency to go in backward direction.

(4) Reaction has gone to completion in forward direction.

Scan or tap for the full solution

Q.10 Consider the following reaction in a sealed vessel at equilibrium with concentrations of

$N_2 = 3.0 \times 10^{-3}$ M, $O_2 = 4.2 \times 10^{-3}$ M and

$NO = 2.8 \times 10^{-3}$ M.

$2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$

If 0.1 mol L^{-1} of $NO_{(g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of $NO_{(g)}$ at equilibrium? [NEET (UG) 2024]

(1) 0.00889 (2) 0.0889

(3) 0.8889 (4) 0.717

Solution

Q.11 At a given temperature and pressure, the equilibrium constant values for the equilibria are given below:

$3A_2 + B_2 \rightleftharpoons 2A_3B$, K_1

$A_3B \rightleftharpoons \frac{3}{2}A_2 + \frac{1}{2}B_2$, K_2

The relation between K_1 and K_2 is : [RE-NEET (UG) 2024]

(1) $K_1^2 = 2K_2$ (2) $K_2 = \frac{K_1}{2}$

(3) $K_1 = \frac{1}{\sqrt{K_2}}$ (4) $K_2 = \frac{1}{\sqrt{K_1}}$

Scan or tap for the full solution

Q.12 For the reaction in equilibrium

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, $\Delta H = -Q$

Reaction is favoured in forward direction by: [RE-NEET (UG) 2024]

(1) use of catalyst

(2) decreasing concentration of N_2

(3) low pressure, high temperature and high concentration of ammonia

(4) high pressure, low temperature and higher concentration of H_2

Scan or tap for the full solution

Q.13 The ratio of solubility of AgCl in 0.1 M KCl solution to the solubility of AgCl in water is: (Given : Solubility product of AgCl = 10^{-10}) [RE-NEET (UG) 2024]

(1) 10^{-4} (2) 10^{-6} (3) 10^{-9} (4) 10^{-5}

Scan or tap for the full solution

Q.14 Amongst the given options which of the following molecules/ion acts as a Lewis acid? [NEET (UG) 2023]

(1) H_2O (2) BF_3 (3) OH^- (4) NH_3

Scan or tap for the full solution

Q.15 The equilibrium concentrations of the species in the reaction $A + B \rightleftharpoons C + D$ are 2, 3, 10 and 6 mol L^{-1}, respectively at 300 K. ΔG° for the reaction is (R = 2 cal/mol K) [NEET (UG) 2023]

(1) −137.26 cal (2) −1381.80 cal

(3) −13.73 cal (4) 1372.60 cal

Scan or tap for the full solution

Q.16 For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, $\Delta H = -92.4$ kJ mol^{-1}. The yield of ammonia increases on [NEET (UG) 2022]

(1) increasing temperature

(2) decreasing pressure

(3) increasing pressure

(4) adding a catalyst

Solution

Q.17 The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is [Given pK_a of CH_3COOH = 4.57] [NEET (UG) 2022]

(1) 5.57 (2) 3.57 (3) 4.57 (4) 2.57

Scan or tap for the full solution

Q.18 $3O_2(g) \rightleftharpoons 2O_3(g)$

for the above reaction at 298 K, K_c is found to be 3.0×10^{-59}. If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is [NEET (UG) 2022]

(1) 4.38×10^{-32} (2) 1.9×10^{-63}

(3) 2.4×10^{31} (4) 1.2×10^{21}

Scan or tap for the full solution

Q.19 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is : [NEET (UG) 2022 (Phase 2)]

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

Scan or tap for the full solution

Q.20 K_p for the following reaction is 3.0 at 1000 K.
$CO_2(g) + C(s) \rightleftharpoons 2CO(g)$
What will be the value of K_c for the reaction at the same temperature?
(Given : R = 0.083 L bar K^{-1} mol^{-1})
[NEET (UG) 2022 (Phase 2)]
(1) 3.6 (2) 0.36
(3) 3.6×10^{-2} (4) 3.6×10^{-3}

Scan or tap for the full solution

Q.21 The pK_b of dimethyl amine and pK_a of acetic acid are 3.27 and 4.77 respectively at T (K). The correct option for the pH of dimethyl ammonium acetate solution is : [NEET (UG) 2021]
(1) 6.25 (2) 8.50 (3) 5.50 (4) 7.75

Scan or tap for the full solution

Q.22 Hydrolysis of sucrose is given by the following reaction.
$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$
If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :
[NEET (UG) 2020]
(1) $8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$
(2) $8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$
(3) $-8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$
(4) $-8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

Scan or tap for the full solution

Q.23 Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.
[NEET (UG) 2020]
(1) 2×10^{-8} M (2) 1×10^{-13} M
(3) 1×10^{8} M (4) 2×10^{-13} M

Scan or tap for the full solution

Q.24 Conjugate base for Brönsted acids H_2O and HF are :
[NEET (UG) 2019]
(1) OH^- and F^-, respectively
(2) H_3O^+ and H_2F^+, respectively
(3) OH^- and H_2F^+, respectively
(4) H_3O^+ and F^-, respectively

Solution

Q.25 pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is :
[NEET (UG) 2019]
(1) 0.125×10^{-15} (2) 0.5×10^{-10}
(3) 0.5×10^{-15} (4) 0.25×10^{-10}

Scan or tap for the full solution

Q.26 Which will make basic buffer? [NEET (UG) 2019]
(1) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(2) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NH_4OH
(3) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(4) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH

Scan or tap for the full solution

Q.27 Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :
pH of which one of them will be equal to 1?
A. 60 mL $\frac{M}{10}$ HCl + 40 mL $\frac{M}{10}$ NaOH
B. 55 mL $\frac{M}{10}$ HCl + 45 mL $\frac{M}{10}$ NaOH
C. 75 mL $\frac{M}{5}$ HCl + 25 mL $\frac{M}{5}$ NaOH
D. 100 mL $\frac{M}{10}$ HCl + 100 mL $\frac{M}{10}$ NaOH
[NEET 2018]
(1) B (2) A (3) D (4) C

Scan or tap for the full solution

Q.28 The solubility of $BaSO_4$ in water is 2.42×10^{-3} g L^{-1} at 298 K. The value of its solubility product (K_{sp}) will be (Given molar mass of $BaSO_4$ = 233 g mol^{-1}) [NEET 2018]
(1) 1.08×10^{-10} $mol^2\ L^{-2}$
(2) 1.08×10^{-12} $mol^2\ L^{-2}$
(3) 1.08×10^{-14} $mol^2\ L^{-2}$
(4) 1.08×10^{-8} $mol^2\ L^{-2}$

Solution

Q.29 Which one of the following conditions will favour maximum formation of the product in the reaction
$A_{2(g)} + B_{2(g)} \rightleftharpoons X_{2(g)}$, $\Delta_r H = -X$ kJ ? [NEET 2018]
(1) Low temperature and high pressure
(2) Low temperature and low pressure
(3) High temperature and high pressure
(4) High temperature and low pressure

Scan or tap for the full solution

Q.30 The equilibrium constants of the following are
$N_2 + 3H_2 \rightleftharpoons 2NH_3$; K_1
$N_2 + O_2 \rightleftharpoons 2NO$; K_2
$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$; K_3
The equilibrium constant (K) of the reaction :
$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ will be [NEET 2017]

(1) $K_2K_3^3/K_1$ (2) K_2K_3/K_1
(3) $K_2^3K_3/K_1$ (4) $K_1K_3^3/K_2$

Scan or tap for the full solution

Q.31 Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} mol L^{-1}. Solubility product of $Ag_2C_2O_4$ is [NEET 2017]
(1) 2.66×10^{-12} (2) 4.5×10^{-11}
(3) 5.3×10^{-12} (4) 2.42×10^{-8}

Scan or tap for the full solution

Q.32 A 20 litre container at 400 K contains $CO_2(g)$ at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be
(Given that : $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$, $K_p = 1.6$ atm) [NEET 2017]
(1) 10 litre (2) 4 litre (3) 2 litre (4) 5 litre

Scan or tap for the full solution

Q.33 Consider the following liquid-vapour equilibrium.
Liquid $\rightleftharpoons$ Vapour
Which of the following relations is correct ? [NEET 2016 (Phase 1)]
(1) $\frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{T^2}$ (2) $\frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2}$
(3) $\frac{d\ln G}{dT^2} = \frac{\Delta H_v}{RT^2}$ (4) $\frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT}$

Scan or tap for the full solution

Q.34 MY and NY_3, two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be true in regard to MY and NY_3? [NEET 2016 (Phase 1)]
(1) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.
(2) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.
(3) The molar solubilities of MY and NY_3 in water are identical.
(4) The molar solubility of MY in water is less than that of NY_3.

Scan or tap for the full solution

Q.35 The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is [NEET 2016 (Phase 2)]
(1) 0.0060% (2) 0.013%
(3) 0.77% (4) 1.6%

Scan or tap for the full solution

Q.36 The solubility of $AgCl_{(s)}$ with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be [NEET 2016 (Phase 2)]
(1) 1.25×10^{-5} M (2) 1.6×10^{-9} M
(3) 1.6×10^{-11} M (4) zero

Scan or tap for the full solution

Q.37 Which of the following fluoro-compounds is most likely to behave as a Lewis base ? [NEET 2016 (Phase 2)]
(1) BF_3 (2) PF_3 (3) CF_4 (4) SiF_4

Scan or tap for the full solution

Q.38 If the equilibrium constant for $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ is K, the equilibrium constant for $\frac{1}{2}N_{2(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons NO_{(g)}$ will be [AIPMT 2015]
(1) $\frac{1}{2}K$ (2) K (3) K^2 (4) $K^{1/2}$

Scan or tap for the full solution

Q.39 What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed? [AIPMT 2015]
(1) 2.0 (2) 7.0 (3) 1.04 (4) 12.65

Scan or tap for the full solution

Q.40 Which one of the following pairs of solution is not an acidic buffer ? [AIPMT 2015]
(1) CH_3COOH and CH_3COONa
(2) H_2CO_3 and Na_2CO_3
(3) H_3PO_4 and Na_3PO_4
(4) $HClO_4$ and $NaClO_4$

Solution

Q.41 The K_{sp} of Ag_2CrO_4, AgCl, AgBr and AgI are respectively, 1.1×10^{-12}, 1.8×10^{-10}, 5.0×10^{-13}, 8.3×10^{-17}. Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr, NaI and Na_2CrO_4? [AIPMT 2015 (Cancelled)]
(1) AgBr (2) Ag_2CrO_4
(3) AgI (4) AgCl

Scan or tap for the full solution

Q.42 If the value of equilibrium constant for a particular reaction is 1.6×10^{12}, then at equilibrium the system will contain [AIPMT 2015 (Cancelled)]

(1) mostly products
(2) similar amounts of reactants and products
(3) all reactants
(4) mostly reactants.

Scan or tap for the full solution

Q.43 Which of the following salts will give highest pH in water? [AIPMT 2014]

(1) KCl (2) NaCl
(3) Na_2CO_3 (4) $CuSO_4$

Solution

Q.44 Using the Gibbs energy change, $\Delta G° = +63.3$ kJ, for the following reaction,

$$Ag_2CO_{3(s)} \rightleftharpoons 2Ag^+_{(aq)} + CO^{2-}_{3\,(aq)}$$

the K_{sp} of $Ag_2CO_{3(s)}$ in water at 25°C is

($R = 8.314\ J\ K^{-1}\ mol^{-1}$) [AIPMT 2014]

(1) 3.2×10^{-26} (2) 8.0×10^{-12}
(3) 2.9×10^{-3} (4) 7.9×10^{-2}

Scan or tap for the full solution

Q.45 For the reversible reaction,

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} + \text{heat}$$

The equilibrium shifts in forward direction [AIPMT 2014]

(1) by increasing the concentration of $NH_{3(g)}$
(2) by decreasing the pressure
(3) by decreasing the concentrations of $N_{2(g)}$ and $H_{2(g)}$
(4) by increasing pressure and decreasing temperature.

Scan or tap for the full solution

Q.46 For a given exothermic reaction, K_p and K'_p are the equilibrium constants at temperatures T_1 and T_2, respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that [AIPMT 2014]

(1) $K_p > K'_p$ (2) $K_p < K'_p$
(3) $K_p = K'_p$ (4) $K_p = \frac{1}{K'_p}$

Scan or tap for the full solution

Q.47 Which of these is least likely to act as a Lewis base ? [NEET 2013]

(1) BF_3 (2) PF_3 (3) CO (4) F^-

Scan or tap for the full solution

Q.48 Identify the correct order of solubility in aqueous medium. [NEET 2013]

(1) $Na_2S > CuS > ZnS$ (2) $Na_2S > ZnS > CuS$
(3) $CuS > ZnS > Na_2S$ (4) $ZnS > Na_2S > CuS$

Scan or tap for the full solution

Q.49 Accumulation of lactic acid ($HC_3H_5O_3$), a monobasic acid in tissues leads to pain and a feeling of fatigue. In a 0.10 M aqueous solution, lactic acid is 3.7% dissociated. The value of dissociation constant, K_a, for this acid will be [NEET 2013 (Karnataka)]

(1) 1.4×10^{-5} (2) 1.4×10^{-4}
(3) 3.7×10^{-4} (4) 2.8×10^{-4}

Scan or tap for the full solution

Q.50 At 100°C the K_w of water is 55 times its value at 25°C. What will be the pH of neutral solution? (log 55 = 1.74) [NEET 2013 (Karnataka)]

(1) 7.00 (2) 7.87 (3) 5.13 (4) 6.13

Scan or tap for the full solution

Q.51 The values of K_{sp} of $CaCO_3$ and CaC_2O_4 are 4.7×10^{-9} and 1.3×10^{-9} respectively at 25°C. If the mixture of these two is washed with water, what is the concentration of Ca^{2+} ions in water ? [NEET 2013 (Karnataka)]

(1) 5.831×10^{-5} M (2) 6.856×10^{-5} M
(3) 3.606×10^{-5} M (4) 7.746×10^{-5} M

Scan or tap for the full solution

Q.52 The dissociation constant of weak acid is 1×10^{-4}. In order to prepare a buffer solution with a pH = 5, the [Salt]/[Acid] ratio should be [NEET 2013 (Karnataka)]

(1) 4 : 5 (2) 10 : 1 (3) 5 : 4 (4) 1 : 10

Scan or tap for the full solution

Q.53 Given that the equilibrium constant for the reaction,

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$$

has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?

$$SO_{3(g)} \rightleftharpoons SO_{2(g)} + \frac{1}{2}O_{2(g)}$$ [AIPMT 2012 (Mains)]

(1) 1.8×10^{-3} (2) 3.6×10^{-3}
(3) 6.0×10^{-2} (4) 1.3×10^{-5}

Scan or tap for the full solution

Q.54 Given the reaction between 2 gases represented by A_2 and B_2 to give the compound AB(g),

$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$

At equilibrium, the concentration of $A_2 = 3.0 \times 10^{-3}$ M, of $B_2 = 4.2 \times 10^{-3}$ M, of $AB = 2.8 \times 10^{-3}$ M

If the reaction takes place in a sealed vessel at 527 °C, then the value of K_c will be

[AIPMT 2012 (Mains)]

(1) 2.0 (2) 1.9 (3) 0.62 (4) 4.5

Scan or tap for the full solution

Q.55 pH of a saturated solution of $Ba(OH)_2$ is 12. The value of solubility product (K_{sp}) of $Ba(OH)_2$ is

[AIPMT 2012 (Prelims)]

(1) 3.3×10^{-7} (2) 5.0×10^{-7}

(3) 4.0×10^{-6} (4) 5.0×10^{-6}

Scan or tap for the full solution

Q.56 Equimolar solutions of the following substances were prepared separately. Which one of these will record the highest pH value ? [AIPMT 2012 (Prelims)]

(1) $BaCl_2$ (2) $AlCl_3$ (3) LiCl (4) $BeCl_2$

Scan or tap for the full solution

Q.57 Buffer solutions have constant acidity and alkalinity because [AIPMT 2012 (Prelims)]

(1) these give unionised acid or base on reaction with added acid or alkali

(2) acids and alkalies in these solutions are shielded from attack by other ions

(3) they have large excess of H^+ or OH^- ions

(4) they have fixed value of pH

Scan or tap for the full solution

Q.58 In qualitative analysis, the metals of group I can be separated from other ions by precipitating them as chloride salts. A solution initially contains Ag^+ and Pb^{2+} at a concentration of 0.10 M. Aqueous HCl is added to this solution until the Cl^- concentration is 0.10 M. What will the concentrations of Ag^+ and Pb^{2+} be at equilibrium ?

(K_{sp} for AgCl = 1.8×10^{-10}, K_{sp} for $PbCl_2 = 1.7 \times 10^{-5}$) [AIPMT 2011 (Mains)]

(1) $[Ag^+] = 1.8 \times 10^{-7}$ M, $[Pb^{2+}] = 1.7 \times 10^{-6}$ M

(2) $[Ag^+] = 1.8 \times 10^{-11}$ M, $[Pb^{2+}] = 8.5 \times 10^{-5}$ M

(3) $[Ag^+] = 1.8 \times 10^{-9}$ M, $[Pb^{2+}] = 1.7 \times 10^{-3}$ M

(4) $[Ag^+] = 1.8 \times 10^{-11}$ M, $[Pb^{2+}] = 1.7 \times 10^{-4}$ M

Scan or tap for the full solution

Q.59 The value of ΔH for the reaction

$X_2(g) + 4Y_2(g) \rightleftharpoons 2XY_4(g)$

is less than zero. Formation of $XY_4(g)$ will be favoured at [AIPMT 2011 (Prelims)]

(1) high temperature and high pressure

(2) low pressure and low temperature

(3) high temperature and low pressure

(4) high pressure and low temperature

Scan or tap for the full solution

Q.60 A buffer solution is prepared in which the concentration of NH_3 is 0.30 M and the concentration of NH_4^+ is 0.20 M. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution? ($\log 2.7 = 0.43$)

[AIPMT 2011 (Prelims)]

(1) 9.08 (2) 9.43 (3) 11.72 (4) 8.73

Scan or tap for the full solution

Q.61 Which of the following is least likely to behave as Lewis base? [AIPMT 2011 (Prelims)]

(1) H_2O (2) NH_3 (3) BF_3 (4) OH^-

Scan or tap for the full solution

Q.62 For the reaction, $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$, the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction,

$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

What is K for the reaction,

$NO_2(g) \rightleftharpoons \frac{1}{2}N_2(g) + O_2(g)$ [AIPMT 2011 (Prelims)]

(1) $\frac{1}{2K_1K_2}$ (2) $\frac{1}{4K_1K_2}$

(3) $\left[\frac{1}{K_1K_2}\right]^{1/2}$ (4) $\frac{1}{K_1K_2}$

Scan or tap for the full solution

Q.63 The reaction,

$2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)} + D_{(g)}$

is begun with the concentrations of A and B both at an initial value of 1.00 M. When equilibrium is reached, the concentration of D is measured and found to be 0.25 M. The value for the equilibrium constant for this reaction is given by the expression

[AIPMT 2010 (Mains)]

(1) $[(0.75)^3(0.25)] \div [(1.00)^2(1.00)]$

(2) $[(0.75)^3(0.25)] \div [(0.50)^2(0.75)]$

(3) $[(0.75)^3(0.25)] \div [(0.50)^2(0.25)]$

(4) $[(0.75)^3(0.25)] \div [(0.75)^2(0.25)]$

Solution

Q.64 If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its K_{sp} is [AIPMT 2010 (Prelims)]

(1) 4.00×10^{-6} M^3 (2) 4.00×10^{-7} M^3
(3) 5.00×10^{-6} M^3 (4) 5.00×10^{-7} M^3

Scan or tap for the full solution

Q.65 What is $[H^+]$ in mol/L of a solution that is 0.20 M in CH_3COONa and 0.10 M in CH_3COOH? K_a for $CH_3COOH = 1.8 \times 10^{-5}$ [AIPMT 2010 (Prelims)]

(1) 3.5×10^{-4} (2) 1.1×10^{-5}
(3) 1.8×10^{-5} (4) 9.0×10^{-6}

Scan or tap for the full solution

Q.66 In which of the following equilibrium K_c and K_p are not equal? [AIPMT 2010 (Prelims)]

(1) $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$
(2) $SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$
(3) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(4) $2C(s) + O_2(g) \rightleftharpoons 2CO(g)$

Scan or tap for the full solution

Q.67 In a buffer solution containing equal concentration of B^- and HB, the K_b for B^- is 10^{-10}. The pH of buffer solution is [AIPMT 2010 (Prelims)]

(1) 10 (2) 7 (3) 6 (4) 4

Scan or tap for the full solution

Q.68 The dissociation constants for acetic acid and HCN at 25°C are 1.5×10^{-5} and 4.5×10^{-10} respectively. The equilibrium constant for the equilibrium $CN^- + CH_3COOH \rightleftharpoons HCN + CH_3COO^-$ would be [AIPMT 2009]

(1) 3.3×10^{-5} (2) 3.3×10^{-4}
(3) 3.3×10^{4} (4) 3.3×10^{5}

Scan or tap for the full solution

Q.69 Which of the following molecules acts as a Lewis acid? [AIPMT 2009]

(1) $(CH_3)_2O$ (2) $(CH_3)_3P$
(3) $(CH_3)_3N$ (4) $(CH_3)_3B$

Scan or tap for the full solution

Q.70 The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is [AIPMT 2009]

(1) 6.50×10^{-12} (2) 5.65×10^{-13}
(3) 5.65×10^{-12} (4) 5.65×10^{-10}

Scan or tap for the full solution

Q.71 What is the $[OH^-]$ in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M $Ba(OH)_2$? [AIPMT 2009]

(1) 0.40 M (2) 0.0050 M
(3) 0.12 M (4) 0.10 M

Scan or tap for the full solution

Q.72 The dissociation equilibrium of a gas AB_2 can be represented as:

$2AB_2(g) \rightleftharpoons 2AB(g) + B_2(g)$

The degree of dissociation is x and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium constant K_p and total pressure P is [AIPMT 2008]

(1) $(2K_p/P)^{1/2}$ (2) (K_p/P)
(3) $(2K_p/P)$ (4) $(2K_p/P)^{1/3}$

Scan or tap for the full solution

Q.73 If the concentration of OH^- ions in the reaction

$Fe(OH)_3(s) \rightleftharpoons Fe^{3+}(aq) + 3OH^-(aq)$

is decreased by 1/4 times, then equilibrium concentration of Fe^{3+} will increase by [AIPMT 2008]

(1) 64 times (2) 4 times
(3) 8 times (4) 16 times

Scan or tap for the full solution

Q.74 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? [AIPMT 2008]

(1) 3.7×10^{-3} M (2) 1.11×10^{-3} M
(3) 1.11×10^{-4} M (4) 3.7×10^{-4} M

Scan or tap for the full solution

Q.75 The value of equilibrium constant of the reaction

$HI(g) \rightleftharpoons \frac{1}{2}H_2(g) + \frac{1}{2}I_2(g)$

is 8.0. The equilibrium constant of the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ will be [AIPMT 2008]

(1) 16 (2) 1/8 (3) 1/16 (4) 1/64

Scan or tap for the full solution

Q.76 The values of K_p for the reactions,

$X \rightleftharpoons Y + Z$ ....(i)
$A \rightleftharpoons 2B$ ....(ii)

are in the ratio 9 : 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (i) and (ii) are in the ratio [AIPMT 2008]

(1) 36 : 1 (2) 1 : 1 (3) 3 : 1 (4) 1 : 9

Scan or tap for the full solution

Q.77 Equimolar solutions of the following were prepared in water separately. Which one of the solutions will record the highest pH? [AIPMT 2008]

(1) $MgCl_2$ (2) $CaCl_2$ (3) $SrCl_2$ (4) $BaCl_2$

Scan or tap for the full solution

Q.78 Which one of the following ionic species has the greatest proton affinity to form stable compound? [AIPMT 2007]

(1) NH_2^- (2) F^- (3) I^- (4) HS^-

Scan or tap for the full solution

Q.79 The equilibrium constants of the following are

$N_2 + 3H_2 \rightleftharpoons 2NH_3$; K_1

$N_2 + O_2 \rightleftharpoons 2NO$; K_2

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$; K_3

The equilibrium constant (K) of the reaction:

$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ will be [AIPMT 2007]

(1) $K_2K_3^3/K_1$ (2) K_2K_3/K_1

(3) $K_2^3K_3/K_1$ (4) $K_1K_3^3/K_2$

Scan or tap for the full solution

Q.80 A weak acid, HA, has a K_a of 1.00×10^{-5}. If 0.100 mol of this acid is dissolved in one litre of water, the percentage of acid dissociated at equilibrium is closest to [AIPMT 2007]

(1) 1.00% (2) 99.9% (3) 0.100% (4) 99.0%

Scan or tap for the full solution

Q.81 Calculate the pOH of a solution at 25°C that contains 1×10^{-10} M of hydronium ions, i.e. H_3O^+. [AIPMT 2007]

(1) 4.000 (2) 9.000 (3) 1.000 (4) 7.000

Scan or tap for the full solution

Q.82 For the reaction :

$CH_{4(g)} + 2O_{2(g)} \rightleftharpoons CO_{2(g)} + 2H_2O_{(l)}$,

$\Delta H_r = -890.3$ kJ mol^{-1}.

Which of the following statements is not true? [AIPMT 2006]

(1) The reaction is exothermic.

(2) At equilibrium, the concentrations of $CO_{2(g)}$ and $H_2O_{(l)}$ are not equal.

(3) The equilibrium constant for the reaction is given by $K_p = \frac{[CO_2]}{[CH_4][O_2]}$

(4) Addition of $CH_{4(g)}$ or $O_{2(g)}$ at equilibrium will cause a shift to the right.

Scan or tap for the full solution

Q.83 Which of the following pairs constitutes a buffer? [AIPMT 2006]

(1) HCl and KCl (2) HNO_2 and $NaNO_2$

(3) NaOH and NaCl (4) HNO_3 and NH_4NO_3

Scan or tap for the full solution

Q.84 The hydrogen ion concentration of a 10^{-8} M, HCl aqueous solution at 298 K ($K_w = 10^{-14}$) is [AIPMT 2006]

(1) 1.0×10^{-8} M (2) 1.0×10^{-6} M

(3) 1.0512×10^{-7} M (4) 9.512×10^{-8} M

Scan or tap for the full solution

Q.85 At 25°C, the dissociation constant of a base, BOH, is 1.0×10^{-12}. The concentration of hydroxyl ions in 0.01 M aqueous solution of the base would be [AIPMT 2005]

(1) 1.0×10^{-5} mol L^{-1} (2) 1.0×10^{-6} mol L^{-1}

(3) 2.0×10^{-6} mol L^{-1} (4) 1.0×10^{-7} mol L^{-1}

Scan or tap for the full solution

Q.86 H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group of qualitative analysis but not those belonging to the fourth group. It is because [AIPMT 2005]

(1) presence of HCl decreases the sulphide ion concentration

(2) solubility product of group II sulphides is more than that of group IV sulphides

(3) presence of HCl increases the sulphide ion concentration

(4) sulphides of group IV cations are unstable in HCl.

Scan or tap for the full solution

Q.87 Equilibrium constants K_1 and K_2 for the following equilibria:

$NO_{(g)} + \frac{1}{2}O_{2(g)} \overset{K_1}{\rightleftharpoons} NO_{2(g)}$ and

$2NO_{2(g)} \overset{K_2}{\rightleftharpoons} 2NO_{(g)} + O_{2(g)}$

are related as [AIPMT 2005]

(1) $K_2 = 1/K_1^2$ (2) $K_2 = K_1^2$

(3) $K_2 = 1/K_1$ (4) $K_2 = K_1/2$

Scan or tap for the full solution

Q.88 The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility (in moles/L) is [AIPMT 2004]

(1) 5.6×10^{-6} (2) 3.1×10^{-4}
(3) 2×10^{-4} (4) 4×10^{-4}

Scan or tap for the full solution

Q.89 The rapid change of pH near the stoichiometric point of an acid-base titration is the basis of indicator detection. pH of the solution is related to ratio of the concentrations of the conjugate acid (HIn) and base (In^-) forms of the indicator by the expression [AIPMT 2004]

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

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

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

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

Scan or tap for the full solution

Q.90 The equilibrium constants of the following are

$N_2 + 3H_2 \rightleftharpoons 2NH_3$; K_1

$N_2 + O_2 \rightleftharpoons 2NO$; K_2

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$; K_3

The equilibrium constant (K) of the reaction :

$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ will be [AIPMT 2003]

(1) $K_2K_3^3/K_1$ (2) K_2K_3/K_1
(3) $K_2^3K_3/K_1$ (4) $K_1K_3^3/K_2$

Scan or tap for the full solution

Q.91 The reaction quotient (Q) for the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is given by

$Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$.

The reaction will proceed from right to left if [AIPMT 2003]

(1) $Q = K_c$ (2) $Q < K_c$ (3) $Q > K_c$ (4) $Q = 0$

Scan or tap for the full solution

Q.92 The solubility product of AgI at 25°C is 1.0×10^{-16} mol^2 L^{-2}. The solubility of AgI in 10^{-4} N solution of KI at 25°C is approximately (in mol L^{-1}) [AIPMT 2003]

(1) 1.0×10^{-16} (2) 1.0×10^{-12}
(3) 1.0×10^{-10} (4) 1.0×10^{-8}

Scan or tap for the full solution

Q.93 Reaction $BaO_{2(s)} \rightleftharpoons BaO_{(s)} + O_{2(g)}$; ΔH = +ve. In equilibrium condition, pressure of O_2 depends on [AIPMT 2002]

(1) increase mass of BaO_2
(2) increase mass of BaO
(3) increase temperature on equilibrium
(4) increase mass of BaO_2 and BaO both

Scan or tap for the full solution

Q.94 Solubility of MX_2 type electrolytes is 0.5×10^{-4} mole/lit., then find out K_{sp} of electrolytes. [AIPMT 2002]

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

Scan or tap for the full solution

Q.95 Which has highest pH? [AIPMT 2002]

(1) CH_3COOK (2) Na_2CO_3
(3) NH_4Cl (4) $NaNO_3$

Scan or tap for the full solution

Q.96 Solution of 0.1 N NH_4OH and 0.1 N NH_4Cl has pH 9.25. Then find out pK_b of NH_4OH [AIPMT 2002]

(1) 9.25 (2) 4.75 (3) 3.75 (4) 8.25

Scan or tap for the full solution

Q.97 In HS^-, I^-, $R–NH_2$, NH_3 order of proton accepting tendency will be [AIPMT 2001]

(1) $I^- > NH_3 > R–NH_2 > HS^-$
(2) $NH_3 > R–NH_2 > HS^- > I^-$
(3) $R–NH_2 > NH_3 > HS^- > I^-$
(4) $HS^- > R–NH_2 > NH_3 > I^-$

Solution

Q.98 Ionisation constant of CH_3COOH is 1.7×10^{-5} and concentration of H^+ ions is 3.4×10^{-4}. Then find out initial concentration of CH_3COOH molecules. [AIPMT 2001]

(1) 3.4×10^{-4} (2) 3.4×10^{-3}
(3) 6.8×10^{-4} (4) 6.8×10^{-3}

Scan or tap for the full solution

Q.99 Solubility of M_2S salt is 3.5×10^{-6} then find out solubility product. [AIPMT 2001]

(1) 1.7×10^{-6} (2) 1.7×10^{-16}
(3) 1.7×10^{-18} (4) 1.7×10^{-12}

Scan or tap for the full solution

Q.100 Correct relation between dissociation constants of a dibasic acid is [AIPMT 2001]

(1) $K_{a_1} = K_{a_2}$ (2) $K_{a_1} > K_{a_2}$

(3) $K_{a_1} < K_{a_2}$ (4) $K_{a_1} = \frac{1}{K_{a_2}}$

Scan or tap for the full solution

Q.101 For any reversible reaction, if we increase concentration of the reactants, then effect on equilibrium constant [AIPMT 2000]

(1) depends on amount of concentration

(2) unchanged

(3) decrease

(4) increase

Solution

Q.102 Conjugate acid of NH_2^- is [AIPMT 2000]

(1) NH_4OH (2) NH_4^+

(3) NH_2^- (4) NH_3

Solution

Q.103 Which statement is wrong about pH and H^+? [AIPMT 2000]

(1) pH of neutral water is not zero.

(2) Adding 1 N solution of CH_3COOH and 1 N solution of NaOH, pH will be seven.

(3) $[H^+]$ of dilute and hot H_2SO_4 is more than concentrated and cold H_2SO_4

(4) Mixing solution of CH_3COOH and HCl. pH will be less than 7.

Scan or tap for the full solution

Q.104 Equilibrium constant K_p for following reaction [AIPMT 2000]

$MgCO_3(s) \rightleftharpoons MgO(s) + CO_2(g)$

(1) $K_p = P_{CO_2}$

(2) $K_p = P_{CO_2} \times \frac{P_{CO_2} \times P_{MgO}}{P_{MgCO_3}}$

(3) $K_p = \frac{P_{CO_2} + P_{MgO}}{P_{MgCO_3}}$

(4) $K_p = \frac{P_{MgCO_3}}{P_{CO_2} + P_{MgO}}$

Scan or tap for the full solution

ANSWER KEY

Ques.	1	2	3	4	5	6	7
Ans.	2	3	4	1	1	2	2
Ques.	8	9	10	11	12	13	14
Ans.	1	3	4	4	4	1	2
Ques.	15	16	17	18	19	20	21
Ans.	2	3	1	1	4	3	4
Ques.	22	23	24	25	26	27	28
Ans.	4	4	1	3	1	4	1
Ques.	29	30	31	32	33	34	35
Ans.	1	1	3	4	2	4	2
Ques.	36	37	38	39	40	41	42
Ans.	2	2	4	4	4	2	1
Ques.	43	44	45	46	47	48	49
Ans.	3	2	4	1	1	2	2
Ques.	50	51	52	53	54	55	56
Ans.	4	4	2	3	3	2	1
Ques.	57	58	59	60	61	62	63
Ans.	1	3	4	2	3	3	2
Ques.	64	65	66	67	68	69	70
Ans.	4	4	4	4	3	4	4
Ques.	71	72	73	74	75	76	77
Ans.	4	4	1	4	4	1	4
Ques.	78	79	80	81	82	83	84
Ans.	1	1	1	1	3	2	3
Ques.	85	86	87	88	89	90	91
Ans.	4	1	1	3	4	1	3
Ques.	92	93	94	95	96	97	98
Ans.	2	3	4	2	2	3	4
Ques.	99	100	101	102	103	104	
Ans.	2	2	2	4	2	1	