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O-I	81 — 88
S-I	59 — 67
O-II	1— 6, 21, 22
O-I	89 — 93
S-I	68 — 70

87

$AgBr \rightarrow Ag^+ + Br^-$

B

C

D

$\boxed{0.2}$

0.1

0.1

$S = [CaCO_3] = \frac{7}{100}$

$K_{sp} = S^2$

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Application of Ksp (Precipitation)

$AgCl_{(s)} \longrightarrow Ag^+ + Cl^-$ $\quad K_{sp}$

$[Ag^+][Cl^-] = Q$

at eqlb^m

$[Ag^+][Cl^-] = Q = K_{sp}$

$Q = K_{sp}$ at eqlb^m

$Q > K_{sp}$ backward (pptn occurs)

$Q < K_{sp}$ more ions can be added

$$[Ag^+][Cl^-] = K_{sp}$$

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Calculation of conc. of ions after ppt^n :→

Case-I If amount added is given

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$A \longrightarrow 2B \qquad \underline{K_c = 10^5\ M} \qquad \underline{[A] = ?}$

$1-x \qquad 2x$

$$\frac{(2x)^2}{1-x} = 10^5$$

$$4x^2 + 10^5 x - 10^5 = 0$$

$$x = \frac{-10^5 + \sqrt{10^{10} + \underbrace{4\times 10^5}\times 4}}{2\times 4}$$

$$= \frac{-10^5 + 10^5\left(1+16\times 10^{-5}\right)^{1/2}}{8}$$

$$= \frac{\cancel{-10^5} + 10^5\left(\cancel{1}+8\times 10^{-5}\right)}{8} = 1$$

$A \longrightarrow 2B \qquad \underline{K_c = 10^5}$

1

$0 \qquad 2$

$x/2 \qquad 2-\cancel{x}$

$$\frac{(2)^2}{(x/2)} = 10^5$$

$$[A] = x/2 = 4\times 10^{-5}$$

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Q. $[Ag^+] = 10^{-5}$ $\quad K_{sp}[AgCl] = 10^{-10}$

$[Cl^-] = 10^{-7}$

ppt will form or not

$Q = 10^{-5} \times 10^{-7} = 10^{-12} < K_{sp}$

Q. find minimum Cl^- required to cause precipitation of AgCl from 0.01 M $AgNO_3(aq)$ solⁿ. $K_{sp}(AgCl) = 10^{-10}$

$[Ag^+][Cl^-] = 10^{-10}$

$(0.01)[Cl^-] = 10^{-10}$

$[Cl^-] = 10^{-8}$

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$A \longrightarrow B \qquad K_c = 10$

$2-x \qquad x$

$K_c = \dfrac{x}{2-x} = \underline{\underline{10}}$

$A \longrightarrow B \qquad K_c = 10$

$y \qquad 5-y$

$\dfrac{[B]}{[A]} = \dfrac{5-y}{y} = 10$

$A \longrightarrow B \qquad K_1$

$K_1 = \dfrac{[B]}{[A]}$

$B \longrightarrow A \qquad 1/K_1$

$\dfrac{[A]}{[B]} = \dfrac{1}{K_1}$

Paper-1

35. For 1 mole of an ideal monoatomic gas on moving from one state to other temperature is doubled but pressure becomes $\sqrt{2}$ times then entropy change in the process will be $\left(R = \frac{2\text{Cal}}{\text{mol}} - K\right)$

(A) $R\ln 2$ (B) $2R\ln 2$ (C) $3R\ln 2$ (D) $\frac{R}{2}\ln 2$

Numerical Value Passage

8gm weak acid HX (molecular mass = 80) is dissolved is 100ml water. ($K_a = 10^{-4}$)

$\frac{8}{80} = 0.1$ mol

$[HX] = \underline{1 M}$

1 lit

$[NaOH] = 0.25$ M

4 lit

$HX + NaOH \rightarrow NaX + H_2O$

1   1 mol   1 mol

$[NaX] = \frac{1}{5} = 0.2$

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45. Which of the following increases with dilution at a given temperature:

(A) pH of 10^{-3}M acetic acid solution ← pH ↑

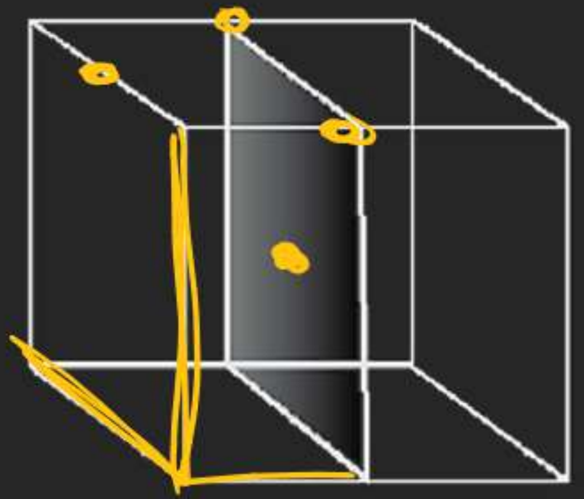
(B) pH of 10^{-3}M aniline solution pH ↓

(C) degree of dissociation of 10^{-3}M acetic acid solution $\alpha \uparrow$ $[H^+] \downarrow$

(D) degree of dissociation of 10^{-3}M aniline solution $\alpha \uparrow$ $[OH^-] \downarrow$

46. Solid AB form NaCl type structure in which A^+ is present at corner & face center of unit cell. If this unit cell is cut in two identical part according to given plane. these parts of unit cell called newly generated unit cell.

$a = b \neq c$



T (A) Empirical formula of AB remains unchanged

T (B) There will be two cations and two anions in newly generated unit cell .

F (C) Cation will be present on each face centres of newly generated unit cell

T (D) Newly generated unit cell will have same parameters that are of tetragonal lattice system

Paper-2

35. For a c MK_3 A (potassium salt of a tribasic acid H_3 A) solution :

(Dissociation constants of acid are K_{a_1}, K_{a_2} & K_{a_3}; h ≪ 1)

$c\,M\ K_3A$

(A) $[\overset{x}{HA^{2-}}] = \sqrt{\frac{cK_w}{K_{a_3}}}$

(B) $[H_2\ A^-] = \frac{K_w}{K_{a_2}}$ $= y$

$\frac{K_w}{K_{a_3}} = \frac{x^2}{c-\cancel{x}}$

$x = \sqrt{\frac{cK_w}{K_{a_3}}}$

(C) $[H_3\ A] = \frac{K_w}{K_{a_1}\ K_{a_2}}\sqrt{\frac{K_w K_{a_3}}{c}}$

(D) $[H_2\ A^-] = \frac{K_w}{K_{a3}}$ ✗

$\frac{K_w}{K_{a_1}} = \frac{x z}{y}$

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36. 10 moles of a liquid is 50% converted into its vapour at normal boiling point 273°C. If heat of vaporization of the liquid is 273 L-atm/mole, then which of the following statement(s) is/are correct for this process.

1 atm

546 K

T (A) Work done by the system is 224 L-atm approximately

T (B) ΔH is equal to 1365 L – atm

T (C) Entropy of surrounding decreases by 2.5 L-atm /K

(D) ΔU is equal to 1589 L-atm

$$w = -\Delta n_g RT$$
$$= -5 \times 0.0821 \times 273 \times 2$$
$$= -5 \times 22.4 \times 2$$
$$= -224$$

$$-\frac{\cancel{273} \times 5 \times}{\cancel{273} \times 2}$$

Numerical Value Passage:

From the following data answer the question:

Reaction A + B $\longrightarrow$ P

[A]M	[B] M	Initial Rate ($Msec^{-1}$)	
		at 300 K	at 400 K
2.5×10^{-4}	3.0×10^{-5}	5.0×10^{-4}	2.0×10^{-3}
5.0×10^{-4}	6.0×10^{-5}	4.0×10^{-3}	
1.0×10^{-3}	6.0×10^{-5}	1.6×10^{-2}	

Integer:

51. If the equilibrium constant of the reaction of a weak acid HA with a strong base is 10^9, then pH of a $0.10M$ NaA solution is

$K_a(HA) = 10^{-5}$