DPP–12 (Solubility Product – Ksp)

Chapter: Ionic Equilibrium

"Some are studying to escape poverty. Some to fulfill a promise. What are you doing this for?"

GROUP–A : Ksp EXPRESSION

Q1. **The correct representation of solubility product of SnS_2 is :-**

(1) $[Sn^{4+}][S^{2-}]^2$

(2) $[Sn^{4+}][S^{2-}]$

(3) $[Sn^{4+}][2S^{2-}]$

(4) $[Sn^{4+}][2S^{2-}]^2$

Q2. **K_{sp} of $Ca_3(PO_4)_2$ is :-**

(1) $[Ca^{2+}][PO_4^{3-}]^2$

(2) $[Ca^{2+}]^3[PO_4^{3-}]^2$

(3) $[Ca^{2+}]^2[PO_4^{3-}]^3$

(4) $[Ca^{2+}][PO_4^{3-}]$

Q3. **The solubility product of As_2S_3 is given by the expression :-**

(1) $K_{sp} = [As^{3+}][S^{2-}]$

(2) $K_{sp} = [As^{3+}][S^{2-}]^2$

(3) $K_{sp} = [As^{3+}]^3[S^{2-}]^2$

(4) $K_{sp} = [As^{3+}]^2[S^{2-}]^3$

Q4. **The expression of solubility product of mercurous iodide is :-**

(1) $[2Hg^{+}]^2 \times 2[I^{-}]^2$

(2) $[Hg^{+}]^2[I^{-}]^2$

(3) $[Hg_2^{2+}][I^{-}]^2$

(4) $[Hg_2^{2+}]^2[I^{-}]^2$

Q5. **What will be the solubility product of AX_3 :-**

(1) 27 s^4

(2) 4 s^3

(3) 36 s^4

(4) 9 s^3

Q6. **If the solubility of lithium sodium hexafluoro aluminate $Li_2Na_3(AlF_6)_2$ is 'S' mol L^{-1}. Its solubility product is equal to :-**

(1) S^8

(2) 12 S^3

(3) $18S^3$

(4) 2916 S^8

Q7. **The solubility of sparingly soluble salt Bi_2S_5 is S mol dm^3. Its solubility product is :-** **[NCERT Pg. 229]**

(1) 6250 S^5

(2) 3125 S^6

(3) 108 S^7
(4) 12500 S^7

Q8. If the solubility of $PbBr_2$ is 'S' g-molecules per litre, considering 100% ionisation its solubility product is :-
(1) $2S^3$
(2) $4S^2$
(3) $4S^3$
(4) $2S^4$

Q9. If 's' and 'S' are respectively solubility and solubility product of a sparingly soluble binary electrolyte then :-
(1) $s = S$
(2) $s = S^2$
(3) $s = S^{1/2}$
(4) $s = \frac{1}{2}S$

Q10. The solubility product of sparingly soluble univalent salt is defined as the product of ionic concentration in a :-
(1) 1 M solution
(2) Concentration solution
(3) Very dilute solution
(4) Saturated solution

GROUP–B : FINDING Ksp FROM SOLUBILITY OR [ION]

Q11. Solubility of MX_2–type electrolytes is 0.5×10^{-4} mol L^{-1} then find out K_{sp} of electrolytes :-
(1) 5×10^{-12}
(2) 25×10^{-10}
(3) 1×10^{-13}
(4) 5×10^{-13}

Q12. Solubility of $BaSO_4 = 2.42 \times 10^{-3}$ g/L. K_{sp} is :-
(1) 1.08×10^{-10}
(2) 1.08×10^{-12}
(3) 1.08×10^{-14}
(4) 1.08×10^{-8}

Q13. If solubility of AgCl is 1.43×10^{-4} g/100mL, K_{sp} is :-
(1) 1×10^{-5}
(2) 2×10^{-5}
(3) 1×10^{-10}
(4) 2×10^{-10}

Q14. One litre of saturated solution of CaCO3 is evaporated to dryness, when 7.0 g of residue is left. The solubility product for CaCO3 is:-
(1) 4.9×10^{-3}
(2) 4.9×10^{-5}
(3) 4.9×10^{-9}
(4) 4.9×10^{-7}

Q15. Concentration of Ag^+ in saturated Ag_2CrO_4 is 1.5×10^{-4} M. K_{sp} is :-

(1) 3.3750×10^{-12}

(2) 1.6875×10^{-10}

(3) 1.68×10^{-12}

(4) 1.6875×10^{-11}

Q16. If the concentration of CrO_4^{2-} ion in a saturated solution of silver chromate will be 2×10^{-4} M, solubility product of silver chromate will be :-

(1) 4×10^{-8}

(2) 8×10^{-10}

(3) 32×10^{-12}

(4) 6×10^{-12}

GROUP–C : FIND SOLUBILITY (s) FROM Ksp

Q17. The K_{sp} for $Cr(OH)_3$ is 1.6×10^{-30}. The molar solubility is :-

(1) $\sqrt[3]{1.610^{-30}}$

(2) $\sqrt[4]{1.610^{-30}}$

(3) $\sqrt[4]{\frac{1.610^{-30}}{27}}$

(4) $1.6\times10^{-30}/27$

Q18. Solubility of A_2X_3 if $K_{sp} = 1.08\times10^{-23}$:-

(1) 10^{-5} M

(2) 3.7×10^{-4} M

(3) 1.2×10^{-3} M

(4) 7.5×10^{-4} M

Q19. M_2SO_4 has $K_{sp} = 1.2\times10^{-5}$. Max $[M^+]$ is :-

(1) 3.46×10^{-3}

(2) 2.89×10^{-2}

(3) 2.8×10^{-3}

(4) 7×10^{-3}

Q20. K_{sp} of $Sr(OH)_2$ is x, then calculate value of $[OH^-]$ in saturated solution?

(1) $\left(\frac{3x}{4}\right)^{1/3}$

(2) $\left(\frac{x}{4}\right)^{1/3}$

(3) $\left(\frac{x}{4}\right)^{1/2}$

(4) $\left(\frac{x}{3}\right)^{1/4}$

Q21. The K_{sp} value for $Gd(OH)_3$ is 2.8×10^{-23}, the pH of $Gd(OH)_3$ in saturated solution :-

(1) 6.08

(2) 5.08

(3) 8.47

(4) 4.08

Q22. pH of saturated $Ba(OH)_2 = 12$. K_{sp} is :-

(1) 5.00×10^{-7}

(2) 4.00×10^{-6}

(3) 4.00×10^{-7}

(4) 5.00×10^{-6}

Q23. K_{sp} of AgCl $= 2.56\times10^{-10}$. Volume needed to dissolve 0.01 mol :-

(1) 800 L
(2) 400 L
(3) 625 L
(4) 50 L

Q24. **How many grams of CaC_2O_4 dissolve in 1L? $K_{sp} = 2.5\times10^{-9}$**
(1) 0.0064 g
(2) 0.0128 g
(3) 0.0032 g
(4) 0.064 g

Q25. **Volume of water needed to dissolve 1g $BaSO_4$ ($K_{sp} = 1.1\times10^{-10}$) :-**
(1) 820 L
(2) 1 L
(3) 205 L
(4) 430 L

Q26. **K_{sp} of $CaSO_4\cdot5H_2O$ is 9×10^{-6}, Find the volume of $CaSO_4$ for 1 gm (Mw = 136)**
(1) 2.45 litre
(2) 5.1 litre
(3) 4.52 litre
(4) 3.2 litre

GROUP–D : RELATION BETWEEN Ksp and SOLUBILITY ORDER

Q27. **The solubility product of CuS, Ag_2S and HgS are 10^{-37}, 10^{-44} and 10^{-54} respectively. The solubility order is :-**
(1) HgS > Ag_2S > CuS
(2) Ag_2S > HgS > CuS
(3) CuS > Ag_2S > HgS
(4) Ag_2S > CuS > HgS

Q28. **Which of the following has maximum solubility (K_{sp} value is given in brackets) :-**
(1) HgS (1.6×10^{-54})
(2) $PbSO_4$ (1.3×10^{-8})
(3) ZnS (7.0×10^{-26})
(4) AgCl (1.7×10^{-10})

Q29. **Maximum soluble is :- (K_{sp} is given)**
(1) CuS (8.5×10^{-36})
(2) CdS (3.6×10^{-28})
(3) ZnS (1.2×10^{-28})
(4) MnS (1.4×10^{-10})

Q30. **If the solubility product of $AgBrO_3$ and Ag_2SO_4 are 5.5×10^{-5} and 2×10^{-5} respectively, the relationship between the solubilities of these can be correctly represented as :-**
(1) s$AgBrO_3$ > sAg_2SO_4
(2) s$AgBrO_3$ = sAg_2SO_4
(3) s$AgBrO_3$ < sAg_2SO_4
(4) Can't predict

Q31. **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 ?**

(1) The molar solubilities of MY and NY_3 in water are identical.

(2) The molar solubility of MY in water is less than that of NY_3.

(3) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.

(4) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.

Q32. **The solubility product of three sparingly soluble salts are given below :**

No.	Formula	Solubility product
1	PQ	4.0×10^{-20}
2	PQ_2	3.2×10^{-14}
3	PQ_3	2.7×10^{-35}

The correct order of decreasing molar solubility is :-

(1) 1, 2, 3

(2) 2, 1, 3

(3) 3, 2, 1

(4) 2, 3, 1

Q33. **If the salts M_2X, QY_2 and PZ_2 have the same solubilities, their K_{sp} values are related as – (S < 1)**

(1) $M_2X = QY_2 < PZ_2$

(2) $M_2X > QY_2 > PZ_2$

(3) $M_2X = PZ_2 < QY_2$

(4) $M_2X < QY_2 < PZ_2$

GROUP–E : COMMON ION

Q34. **At 25°C, K_{sp} of AgCl is 1.8×10^{-10}. If 10^{-5} mol Ag^+ is added, K_{sp} becomes :-**

(1) 1.8×10^{-15}

(2) 1.8×10^{-10}

(3) 1.8×10^{-5}

(4) 18×10^{-10}

Q35. **K_{sp} of $Ni(OH)_2 = 2\times10^{-15}$. Solubility in 0.01M NaOH :-**

(1) 2×10^{-15}

(2) $2^{1/3}\times10^{-5}$

(3) 2×10^{-11}

(4) 10^{-7}