AgI se forme en premier

Serie 4

Ex 1:

1) • $[Ag(NH_3)_2]^+$: Diamine Argent (I)

$x + (0)2 = +1$

$x + (0)4 = +2$

• $[Cu(H_2O)_4]^{2+}$ = Titra_aqua cuivre (I)

• $[Cr(Cl)_2(H_2O)_4]^+$: dichloro_titra aqua crome (I)

• $[Ag(S_2O_3)]^-$ Ion_thiosulfate_Argentate (II)

$Fe(CO)_5$ Penta_carbonyl fer

$[Al(OH)_4(H_2O)_2]^-$: Ion_tetra Hydroxo diaqua Aliminate

2) • ion Hexaammine cobalt III $[Co(NH_3)_6]$

• ion tétraiodo mercurate II $[Hg(I)_4]^{2-}$

• ion dithiosulfato argentate I $[Ag(S_2O_3)_2]$

• ion hexacyano cobaltate II $[Co(CN)_6]$

• ion tetraaqua cuivre II $[Cu(H_2O)_4]^{2+}$

• ion hexaaqua chrome II $[Cr(H_2O)_6]^{3+}$

Ex 2:

1) $[Fe(CN)_6]^{4-} \rightleftharpoons Fe^{2+} + 6CN^-$

$t=0$: 0 — 0 — 0

t_e: $c - x$ — x — $6x$

$$K_d = \frac{[Fe^{2+}][CN^-]^6}{[Fe(CN)_6]^{4-}} = \frac{6^6 x^7}{c - x}$$

$[CN^-] = 6x = 1{,}7 \times 10^{-6}$

$x = 2{,}8 \times 10^{-7}$ M

$C = 1$ mol $\gg x$

$$K_d = \frac{(2{,}83 \times 10^{-7})^7 \times 6^6}{1}$$

$K_d = 6{,}29 \times 10^{-42}$

2) $[Hg(CN)_4]^{-2} \rightleftharpoons Hg^{2+} + 4CN^-$

$c - x$ — x — $4x$

$$K_d = \frac{[Hg^{2+}][CN^-]^4}{[Hg(CN)_4^{2-}]} = \frac{x(4x)^4}{c - x}$$

$c = 10^{-1}$ mol $\gg$

$$K_d = \frac{256\, x^5}{c} = 4 \times 10^{-42}$$

$$x = \sqrt[5]{\frac{K_d \times C}{256}} = 1{,}09 \times 10^{-9}\ M$$

$[Hg^{2+}] = 1{,}09 \times 10^{-9}$ mol/L M

$[CN^-] = 4{,}37 \times 10^{-9}$ M

Ex 3:

1) $AgBr \rightleftharpoons Ag^+ + Br^-$

S — S

S' — $S' + c$

$K_s = [Ag^+][Br^-] = S^2$

S (mg/l) $\rightarrow$ S (mol/l) $\frac{10^{-3}}{M}$

$S = 6{,}33 \times 10^{-7}$ M

$K_s = S^2 = 4 \times 10^{-13}$

2) $NaBr \rightarrow Na^+ + Br^-$

$c = 0{,}5\ M$

$c \gg S'$

$K_s = S'(S' + c)$

$K_s = S'(c) \Rightarrow S' = \frac{K_s}{c} = 8{,}32 \times 10$

3) $Ag^+ + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$

$S = [Ag^+] + [Ag(NH_3)_2^+]$ (1)

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

$S \quad S$

$K_s = [Ag^+][Br^-] = S \times S$ (2)

$K_d = \frac{[Ag^+][NH_3]^2}{[Ag(NH_3)_2]^+}$ (3)

(3) $\Leftrightarrow [Ag(NH_3)_2]^+ = \frac{[Ag^+][NH_3]^2}{K_d}$

(3) in (1) $S'' = [Ag^+] + \frac{[Ag^+][NH_3]^2}{Kd}$

$S'' = [Ag^+]\left(1 + \frac{[NH_3]^2}{Kd}\right)$

$[Ag^+] = \frac{S'' Kd}{Kd + [NH_3]^2}$

$K_s = S'' \times \frac{S'' Kd}{Kd + [NH_3]^2} = S''^2 \times \frac{Kd}{Kd + [NH_3]^2}$

$S'' = \sqrt{\frac{K_s (Kd + [NH_3]^2)}{Kd}}$

$S'' = \sqrt{\frac{4 \times 10^{-10} (1,6 \times 10^{-7} + 0,5^2)}{1,6 \times 10^{-7}}}$

$S'' = 7,9 \times 10^{-4}$ mol/L

Ex4:

$FeCl_3 \rightarrow Fe^{3+} + 3Cl^-$

$NH_4HCN \rightarrow NH_4^+ + SCN^-$

$Fe^{3+} + SCN^- \rightarrow Fe(SCN)^{2+}$

$K_f = \frac{[Fe(SCN)^{2+}]}{[Fe^{3+}][SCN^-]}$

$x = [Fe(SCN)^{2+}]$

$[Fe^{3+}]_T = [Fe^{3+}]_R + x$

$[Fe^{3+}]_R = [Fe^{3+}]_T - x$

$[SCN]_T = [SCN]_R + x$

$[SCN]_R = [SCN]_T - x$

$K_f = \frac{x}{([Fe^{3+}]_T - x)([SCN]_T - x)}$

$x = K_f(x^2 - (10^{-3} + 1)x + 10^{-3})$

$100x^2 - 101,1x + 0,1 = 0$

$x_1 = 1,01M \qquad x_2 = 0,99 \times 10^{-3}M$

on choisit $x = 0,99 \times 10^{-3}M$

Le Fe^{3+} se complexe totalement

$NaF \rightarrow Na^+ + F^-$

$Fe^{3+} + F^- \rightleftharpoons FeF^{2+}$

$Kd = \frac{[Fe^{3+}][F^-]}{[FeF^{2+}]}$

$[NaF] = y$

$y = [F^-] + [FeF^{2+}]$

$[SCN]_T = 1 - [Fe(SCN)^{2+}] = 1 - 10^{-6} = 1$

$[Fe^{3+}] = \frac{10^{-6}}{10^2} = 10^{-8}M$

$[Fe^{3+}]_T = [Fe^{3+}]_R + [Fe(SCN)^{2+}] + [FeF^{2+}]$

$[FeF^{2+}] = [Fe^{3+}]_T - [Fe(SCN)^{2+}] - [Fe^{3+}]_R$

$= 10^{-7} - 10^{-6} - 10^{-8} = 10^{-7}$

$[F^-] = \frac{Kd[FeF^{2+}]}{[Fe^{3+}]}$

$[F^-] = \frac{3,2 \times 10^{-6} \times 10^{-7}}{10^{-8}} = 0,32M$

$y = [F^-] + [FeF^{2+}] = 10^{-3} + 0,32$

$= 0,321M$

$C = \frac{n}{MV} \Rightarrow m = CMV = 0,321 \times 42 \times 1$

$m = 13,48g$