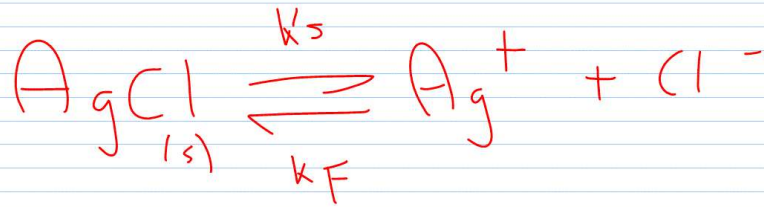


Clase 13 3 dic 2021

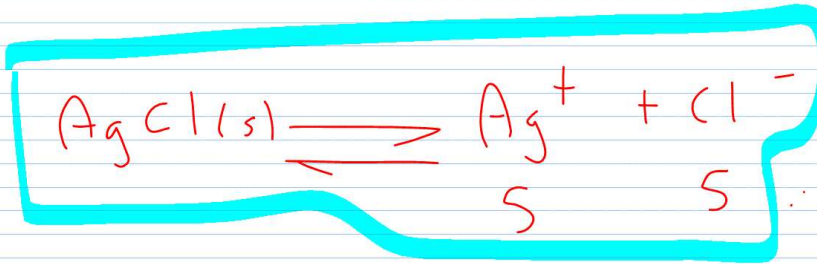
03/12/2021



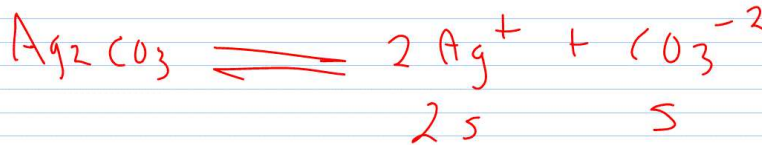
$$k_s = 10^{-9.81}$$

$$\begin{aligned} pK_s &= -\log k_s = -\log 10^{-9.81} \\ &= 9.81 \end{aligned}$$

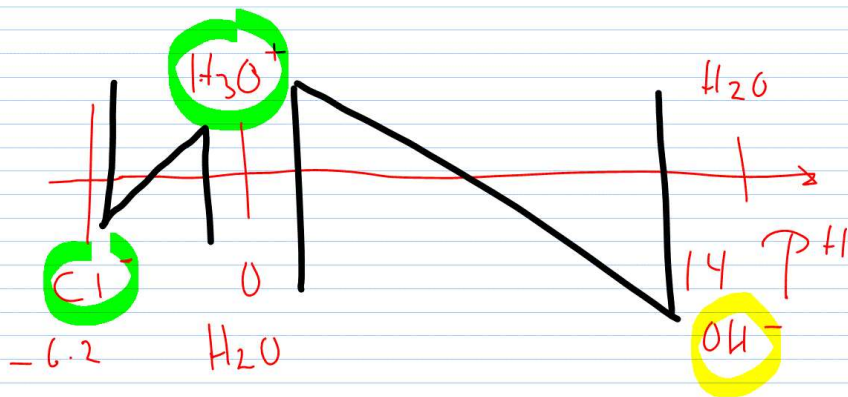
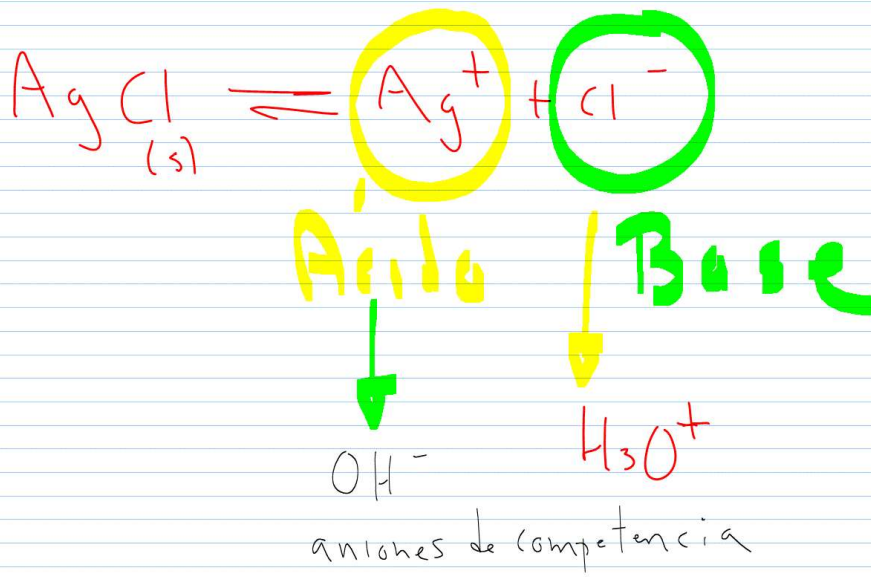
$$k_F = \frac{1}{k_s} = \frac{1}{10^{-9.81}} = 10^{9.81}$$



$$\begin{aligned} s^2 &= k_s \\ s &= \sqrt{k_s} \end{aligned}$$



$$\begin{aligned} 4s^3 &= k_s \\ s &= \sqrt[3]{\frac{k_s}{4}} \end{aligned}$$



$$pH = 1$$

$$\alpha_{Cl^-(H_3O^+)} = 1 + \beta_D [H_3O^+]$$

$$= 1 + 10^{-6.2} [H_3O^+] = 1 + 10^{-7.2} \approx 1$$

$$\beta_D = \frac{1}{K_a} = \frac{1}{10^{6.2}} = 10^{-6.2}$$

$\alpha_{Cl^-(H_3O^+)}$	=	1	+	$\beta_D [H_3O^+]$
$\alpha_{Cl^-(H_3O^+)}$	=	1	+	$6.3096e-15$
$\alpha_{Cl^-(H_3O^+)}$	=	1.0000e+0	LOG =	2.7001e-15

$$\alpha_{Ag(OH^-)} = 1 + \beta_1 [OH^-] + \beta_2 [OH^-]^2 + \beta_3 [OH^-]^3$$

DATOS				
Ag(OH)	HCl	AgCl	Valores Modificables	
pKs	7.60	pKs	9.81	Co = 0.01000
$\beta_1$	2.80	pKa	-6.20	pH = 8.00
$\beta_2$	3.60			
$\beta_3$	4.80			

$\alpha_{Ag(OH)}$	=	1	+	$\beta_1 [OH^-]$	+	$\beta_2 [OH^-]^2$	+	$\beta_3 [OH^-]^3$
$\alpha_{Ag(OH)}$	=	1	+	$1.9953e-4$	+	$3.9811e-9$	+	$6.3096e-14$
$\alpha_{Ag(OH)}$	=	1.000200	LOG =	8.6646e-5				

pH de inicio de precipitación

$$Co = 0.010000$$



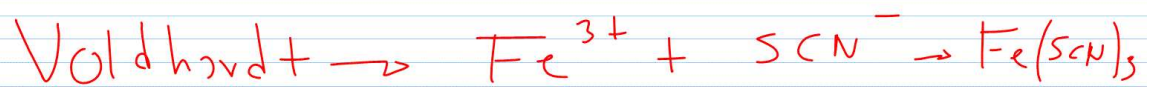
$$pH = 8.40$$

$$K_s = [Ag][OH] = 2.5119 \times 10^{-8}$$

$$[OH] = \frac{K_s}{[Ag]} = \frac{2.5119 \times 10^{-8}}{0.01} = 2.5119 \times 10^{-6}$$

$$[OH] = 2.5119 \times 10^{-6}$$

$$pH = 14 + \log 2.5119 \times 10^{-6} = 8.4$$

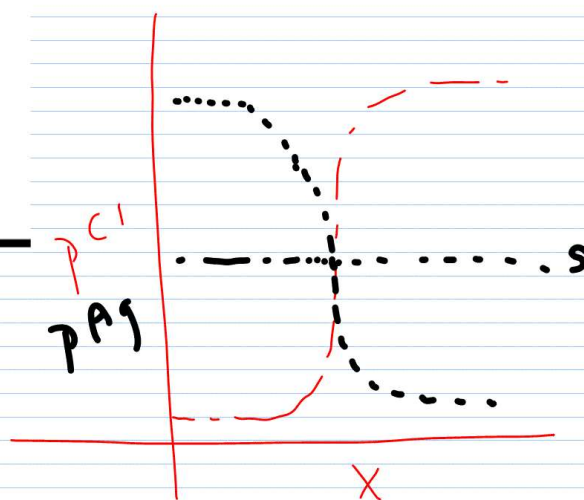


Fajans  $\rightarrow$  indicador adsorción  
(eosina)

Rojas  
SCN<sup>-</sup>

Mohr  $\rightarrow CrO_4^{2-}$  indicador

	Cl <sup>-</sup>	+	Ag <sup>+</sup>	↔	AgCl
Inicio	Co				
Agregado			xCo		
APE	Co(1-x)		~0		
PE	ECo		ECo		
DPE	~0		Co(x-1)		



x	pCl	pAg
0		
0.5		
1		
1.5		
2		

$pH = 4$

$$\alpha_{Ag(OH^-)} = \frac{[Ag^+]' }{[Ag^+]_L}$$

$$K_S' = [Ag^+]' [Cl^-]'$$

$$\alpha_{Cl(H_3O^+)} = \frac{[Cl^-]'}{[Cl^-]_L}$$

$$K_S' = \alpha_{Ag(OH^-)} [Ag^+]_L \alpha_{Cl(H_3O^+)} [Cl^-]_L$$

$$K_S' = K_S \alpha_{Ag(OH^-)} \alpha_{Cl(H_3O^+)}$$

$$K_S' = 10^{-9.81} 10^2 10^0 = 10^{-7.81}$$

$$pH = 4$$

$$\begin{aligned} \alpha_{Ag(OH^-)} &= 1 + 10^{2.3} [10^{-10}] + 10^{3.6} [10^{-10}]^2 + 10^{5.2} [10^{-10}]^3 \\ &= 1 + 10^{-7.7} + 10^{-16.4} + 10^{-25.2} \\ &= 1 \end{aligned}$$

$$\begin{aligned} K_S' &= K_S \alpha_{Ag(OH^-)} \alpha_{Cl(H_3O^+)} \\ &= 10^{-9.81} 10^0 10^0 = 10^{-9.81} \end{aligned}$$

$$P.e. \quad K_s = [Ag^+][I^-]$$

$$= \xi C_0 \quad \xi C_0$$

$$\xi = \sqrt{\frac{K_s}{C_0^2}} = \sqrt{\frac{10^{-9.81}}{(10^{-1})^2}}$$

$$\xi = 10^{-7.81/2} = 10^{-3.905}$$

$$1/Q = (1 - \xi) 100 = 99.98\%$$

Cuantitividad		
Kr	=	6.4565e+9
ε	=	1.2445e-4
%Q	=	99.9876
Cuantitativo		

$$X = 0$$

$$pCl = -\log [Cl^-] + \log \alpha_{Cl(H_3O^+)}$$

$$\alpha_{Cl(H_3O^+)} = \frac{[Cl^-]'}{[Cl^-]_L}$$

$$\left[ [Cl^-]_L = \frac{[Cl^-]'}{\alpha_{Cl(H_3O^+)}} \right] - \log$$

$$pCl = -\log [Cl^-] + \log \alpha_{Cl(H_3O^+)}$$

$$= -\log 10^{-1} + \log 10^0$$

$$= 1$$

$$pAg^+ = \text{incalculable } X = 0$$



$$x = 0.5$$

$$\begin{aligned} \text{pCl}^- &= -\log [\text{Cl}^-] + \log \alpha_{\text{Cl}(\text{H}_3\text{O}^+)} \\ &= -\log [c_0(1-x)] + \log 10^0 \\ &= -\log 10^{-1}(1-0.5) + 0 \\ &= -\log 10^{-1}(0.5) = 1.3 \end{aligned}$$

$$x = 0.5$$

$$\text{pAg}^+ =$$

$$\alpha_{\text{Ag}(\text{OH})} = \frac{[\text{Ag}^+]'}{[\text{Ag}^+]_L}$$

$$K_s' = [\text{Ag}^+] [\text{Cl}^-]$$

$$[\text{Ag}]_L = \frac{[\text{Ag}^+]'}{\alpha_{\text{Ag}(\text{OH})}}$$

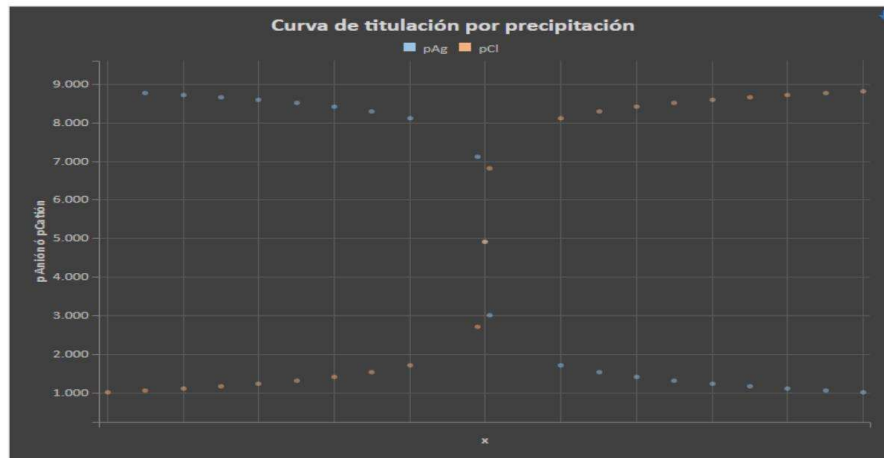
$$\left[ [\text{Ag}^+] = \frac{K_s'}{[\text{Cl}^-]} \right] - \log$$

$$\begin{aligned}
 pAg^+ &= -\log Ks' + \log [Cl^-] + \log \alpha_{Ag(04)} \\
 &= -\log 10^{-9.81} + \log (0.1-x) + \log 10^0 \\
 &= 9.81 + \log 10^{-1}(1-0.5) + 0 \\
 &= 9.81 - 1.3 + 0 = 8.51
 \end{aligned}$$

$$\left. \begin{aligned}
 &X=1 \\
 &[Ag^+] = [Cl^-] \\
 &Ks' = S^2 \qquad S = \sqrt{Ks'}
 \end{aligned} \right\}$$

$$\begin{aligned}
 pAg^+ &= -\log \sqrt{Ks} & pCl^- &= -\log \sqrt{Ks} \\
 &= -\log 10^{-9.81/2} & &= 4.905
 \end{aligned}$$

x	pAg	pCl
0.00	INCALC	1.000
0.10	8.764	1.046
0.20	8.713	1.097
0.30	8.655	1.155
0.40	8.588	1.222
0.50	8.509	1.301
0.60	8.412	1.398
0.70	8.287	1.523
0.80	8.111	1.699
0.98	7.111	2.699
1.00	4.905	4.905
1.01	3.000	6.810
1.20	1.699	8.111
1.30	1.523	8.287
1.40	1.398	8.412
1.50	1.301	8.509
1.60	1.222	8.588
1.70	1.155	8.655
1.80	1.097	8.713
1.90	1.046	8.764
2.00	1.000	8.810



$$x = 1.5$$

$$pCl = -\log K_s' + \log [Ag^+] + \log \alpha_{Cl}(H_3O^+)$$

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

$$\left[ [Cl^-] = \frac{K_s'}{[Ag^+]} \right] - \log$$

$$x = 1.5$$

$$\begin{aligned} pCl &= -\log K_s' + \log [Ag^+] + \log \alpha_{Cl}(H_3O^+) \\ &= -\log 10^{-9.81} + \log C_0(x-1) + \log 10^0 \\ &= 9.81 + \log 10^{-1}(1.5-1) + 0 \\ &= 9.81 - 1.3 = 8.51 \end{aligned}$$

$$x = 1.5$$

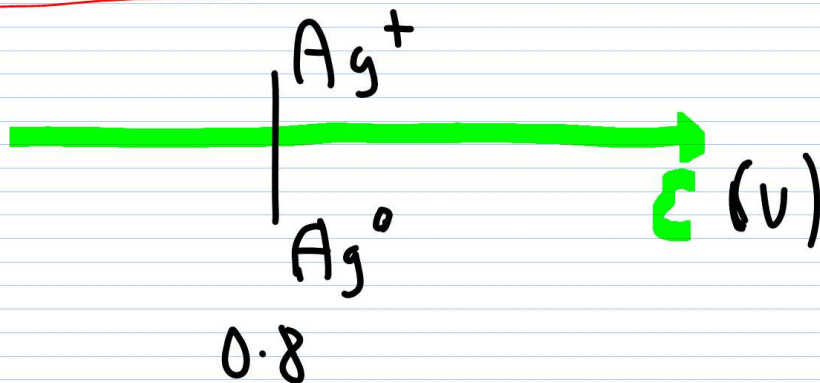
$$\begin{aligned} pAg &= -\log [Ag^+] + \log \alpha_{Ag}(OH) \\ &= -\log C_0(x-1) + \log 10^0 \\ &= -\log 10^{-1}(1.5-1) + 0 \\ &= -\log 5 \times 10^{-2} = 1.3 \end{aligned}$$

$$x = 2$$

$$\begin{aligned} pCl &= -\log K_{s'} + \log [Ag^+] + \log \alpha_{Cl}(H_3O^+) \\ &= -\log 10^{-9.81} + 10^{-1}(2-1) + 10^0 \\ &= 9.81 - 1 + 0 = 8.81 \end{aligned}$$

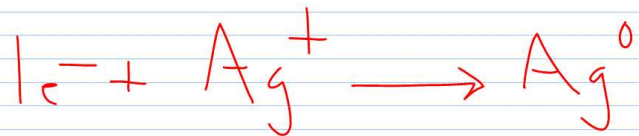
$$\begin{aligned} pAg &= -\log [Ag^+] + \log \alpha_{Ag}(OH) \\ &= -\log (0.1(x-1)) + \log 10^0 = -\log 10^{-1} + 0 \\ &= 1 \end{aligned}$$

Aumenta poder reductor



Aumenta poder oxidante

$$\begin{aligned} E &= E^{\circ}_{\text{Ag}^+/\text{Ag}^0} + \frac{0.06}{n} \log [\text{Ag}^+] \\ &= 0.8\text{V} + \frac{0.06}{1} \log [\text{Ag}^+] \end{aligned}$$



$$E = 0.8\text{V} + \frac{0.06}{1} \log [\text{Ag}^+]$$

$X = 0$  incalculable

$$X = 0.5$$

$$\begin{aligned} E &= 0.8\text{V} + 0.06 \log \frac{X^5}{[\text{I}^-]} \\ &= 0.8\text{V} + 0.06 \log \frac{10^{-9.81}}{C_0(1-X)} \\ &= 0.8\text{V} + 0.06 \log \frac{10^{-9.81}}{10^{-1}(0.5)} \end{aligned}$$

$$\xi = 0.8V + 0.06 \log \frac{10^{-9.81}}{10^{-1.3}}$$

$$\xi = 0.8V + 0.06 \log 10^{-8.51}$$

$$\xi = 0.8V + 0.06(-8.51)$$

$$\xi = 0.8V - 0.5106 = 0.289V$$

$$x=1$$

$$\xi = 0.8V + \frac{0.06}{1} \log [Ag^+]$$

$$[Ag^+] = [Cl^-] = s^2$$

$$s^2 = K_s$$

$$s = \sqrt{K_s}$$

$$\xi = 0.8V + 0.06 \log \sqrt{10^{-9.81}}$$

$$\mathcal{E} = 0.8 \text{ V} + 0.06 \log 10^{-4.905}$$

$$\mathcal{E} = 0.8 \text{ V} + 0.06 (-4.905)$$

$$\mathcal{E} = 0.8 \text{ V} - 0.2943 \text{ V} = 0.5057 \text{ V}$$

$$x = 1.5$$

$$\mathcal{E} = 0.8 \text{ V} + \frac{0.06}{1} \log [\text{Ag}^+]$$

$$\mathcal{E} = 0.8 \text{ V} + 0.06 \log C_0 (x-1)$$

$$= 0.8 \text{ V} + 0.06 \log 10^{-1} (1.5-1)$$

$$= 0.8 \text{ V} + 0.06 \log 10^{-1} (0.5)$$

$$= 0.8 \text{ V} + 0.06 \log 10^{-1.3} = 0.8 \text{ V} - 0.06 (1.3)$$

$$= 0.722 \text{ V}$$



$$x = 2$$

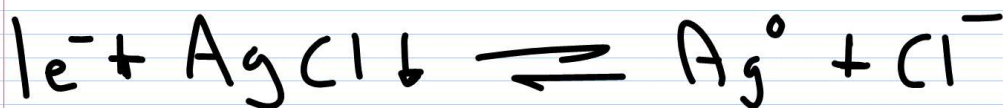
$$\xi = 0.8v + \frac{0.06}{1} \log [Ag^+]$$

$$\xi = 0.8v + 0.06 \log C_0(x-1)$$

$$= 0.8v + 0.06 \log 10^{-1}(2-1)$$

$$= 0.8v + 0.06 \log 10^{-1}(1)$$

$$= 0.8v + 0.06 \log 10^{-1} = 0.8v - 0.06(1) = 0.74v$$



$$\xi = \xi^{\circ} AgCl/Ag^0 + 0.06 \log \frac{1}{[Cl^-]}$$

$$\xi = 0.212v - 0.06 \log [Cl^-] \quad p.e.$$

$$\xi = 0.212v - 0.06 \log \sqrt{K_s}$$

$$\xi = 0.212 \text{ V} - 0.06 \log \sqrt{K_3}$$

$$\xi = 0.212 \text{ V} - 0.06 \log \sqrt{10^{-9.81}}$$

$$\xi = 0.212 \text{ V} - 0.06 \log 10^{-4.905}$$

$$\xi = 0.212 \text{ V} + 0.06(4.905) = 0.5063 \text{ V}$$