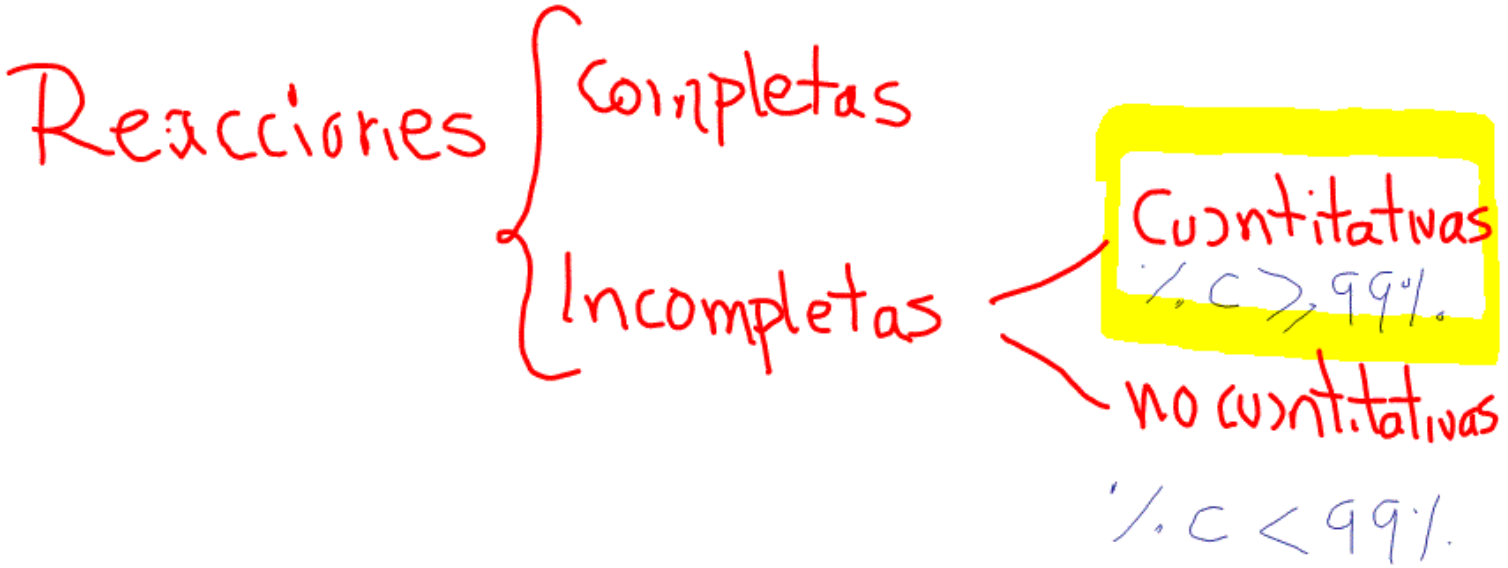
Clase 1 25 septiembre de 2020

Título de la nota 25/09/2020



$$pH = -\log a_{H_3O^+}$$

$$a = [\,]\,\gamma$$

$\gamma \to 1$ ideal.

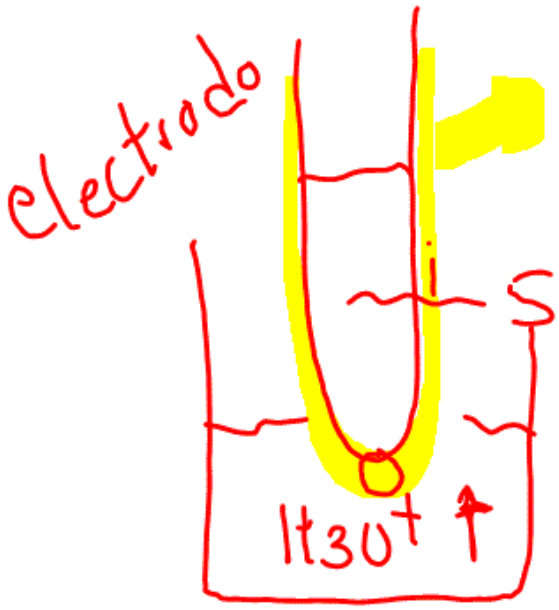
$[\,] \simeq 0.01$ M

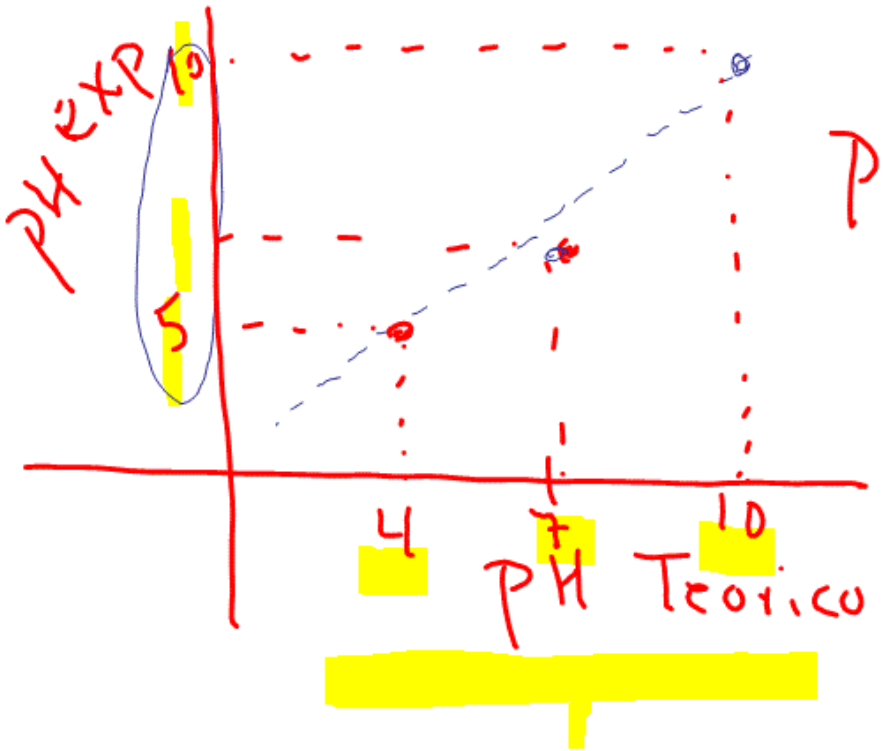
$$I = \left(\sum_{i=1}^{n} c_i z^2 \right) / 2$$

Debye- Hückel

y

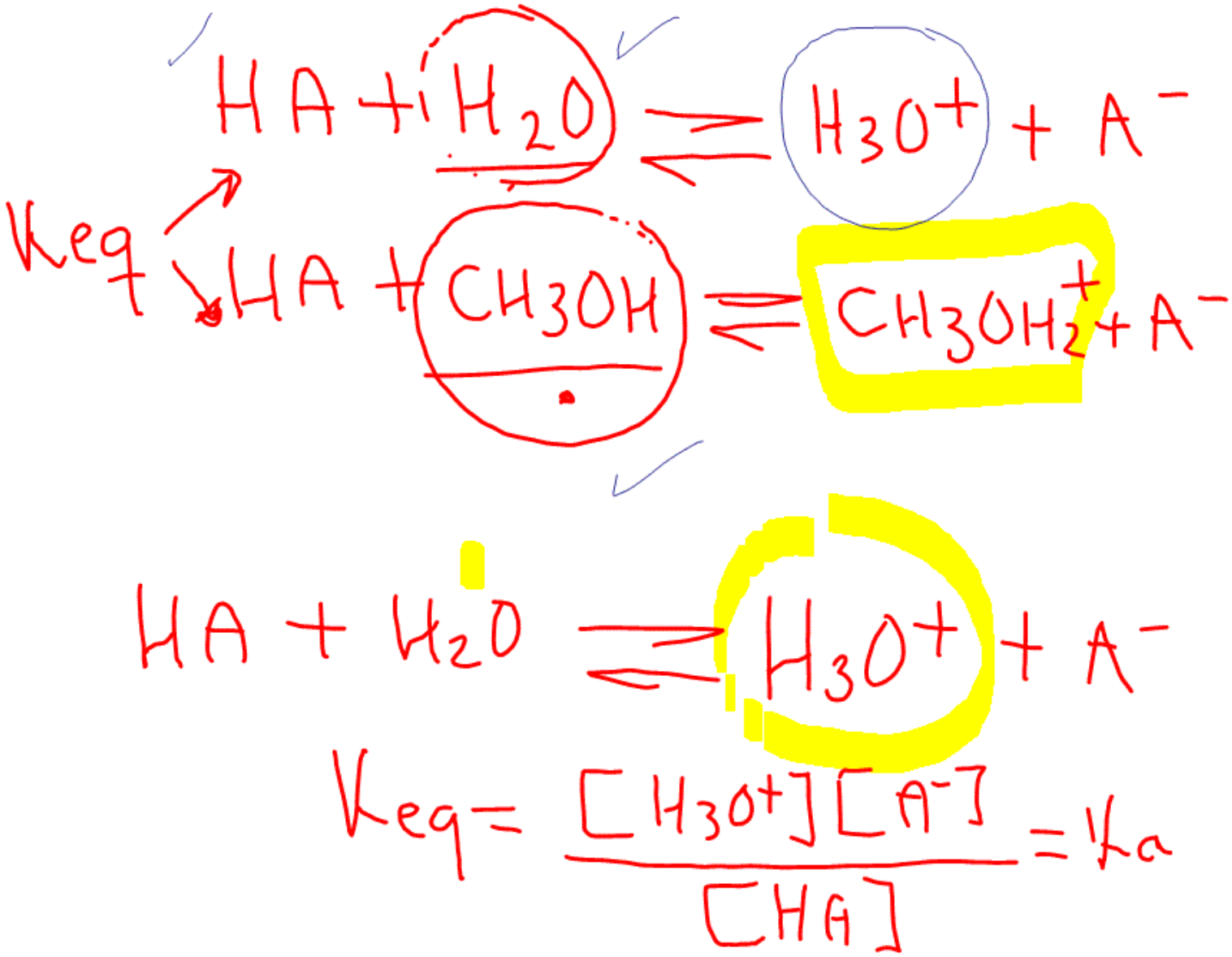
Na^+ H_3O^+





Pendiente < 0.95

electrodo hay que cambiarlo



$$K_b K_a = K_w$$

$$K_w = [H_3O^+][OH^-] = 10^{-14}$$

a 25°C

$$K_a = \frac{K_w}{K_b} \quad \therefore \quad K_b = \frac{K_w}{K_a}$$

$$pKa = -\log Ka$$

$$pKw = -\log Kw$$

$$pKb = -\log Kb$$

$$pKa + pkb = pKw$$

$$pKa + pKb = 14$$

$$\{[H_3O^+][OH^-] = K_w\} - \log$$

$$-\log[H_3O^+] - \log[OH^-] = -\log K_w$$

$$pH + pOH = pK_w$$

$$pH + pOH = 14$$

$$pH = 14 - pOH$$

$$pH = 14 + \log[OH^-]$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

Diagrama de Distribución de especies

$[HA]$ y $[A^-]$

$$\% A^- = \frac{[A^-]}{[A^-]+[HA]} \times 100$$

$$[HA] = \frac{[A^-][H_3O^+]}{Ka}$$

$$\frac{1}{Ka} = \beta p$$

$$\% A^- = \frac{[A^-]}{[A^-]+[HA]} \times 100$$

$$\%\,A^- = \frac{[A^-]}{[A^-] + [A^-][H_3O^+]\beta_p} \times 100$$

$$\%\,A^- = \frac{[A^-]}{[A^-]\{1 + [H_3O^+]\beta_p\}}$$

$$\%\,A^- = \frac{1}{1 + \beta_p[H_3O^+]} \times 100$$

$$\%\,HA = \frac{[HA]}{[HA]+[A^-]} \times 100$$

$$\%\,HA = \frac{[A^-]\,[HA]}{[A^-]\,[HA]+[A^-]} \times 100$$

$$\%\,HA = \%\,A^- \frac{[HA]}{[A^-]}$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

$$\frac{[HA]}{[A^-]} = \frac{[H_3O^+]}{K_a} = \beta_p [H_3O^+]$$

$$\frac{1}{K_a} = \beta_p$$

$$\%\,HA = \%\,A^- \beta p [H_3O^+]$$

$$\%\,A^- = \frac{1}{1 + \beta p [H_3O^+]}$$

$HA =$ $pKa = 5$

3
4
5
6
7

pH

% A^-	% HA	pH
1	99	3
9	91	4
50	50	5
91	9	6
99	1	7

$$pH = 5$$

$$\% A^- = \frac{1}{1 + \beta p [H_3O^+]} \times 100$$

$$\% A^- = \frac{1}{1 + 10^5 [10^{-5}]} \times 100 = \frac{1}{2} \times 100 = 50\%$$

$$\frac{1}{Ka} = \frac{1}{10^{-5}}$$

$$\%HA = \%A^- \beta p [H_3O^+]$$

$$pH = 5 \qquad = 50\% \cdot 10^5 [10^{-5}]$$

$$= 50\% \cdot 10^0$$

$$= 50\% \checkmark$$

$$pH = 4$$

$$\% A^- = \frac{1}{1 + \beta p [H_3O^+]} \times 100$$

$$= \frac{1}{1 + 10^5 [10^{-4}]} \times 100$$

$$= \frac{1}{1 + 10} \times 100 = \frac{1}{11} \times 100 = 9.1$$

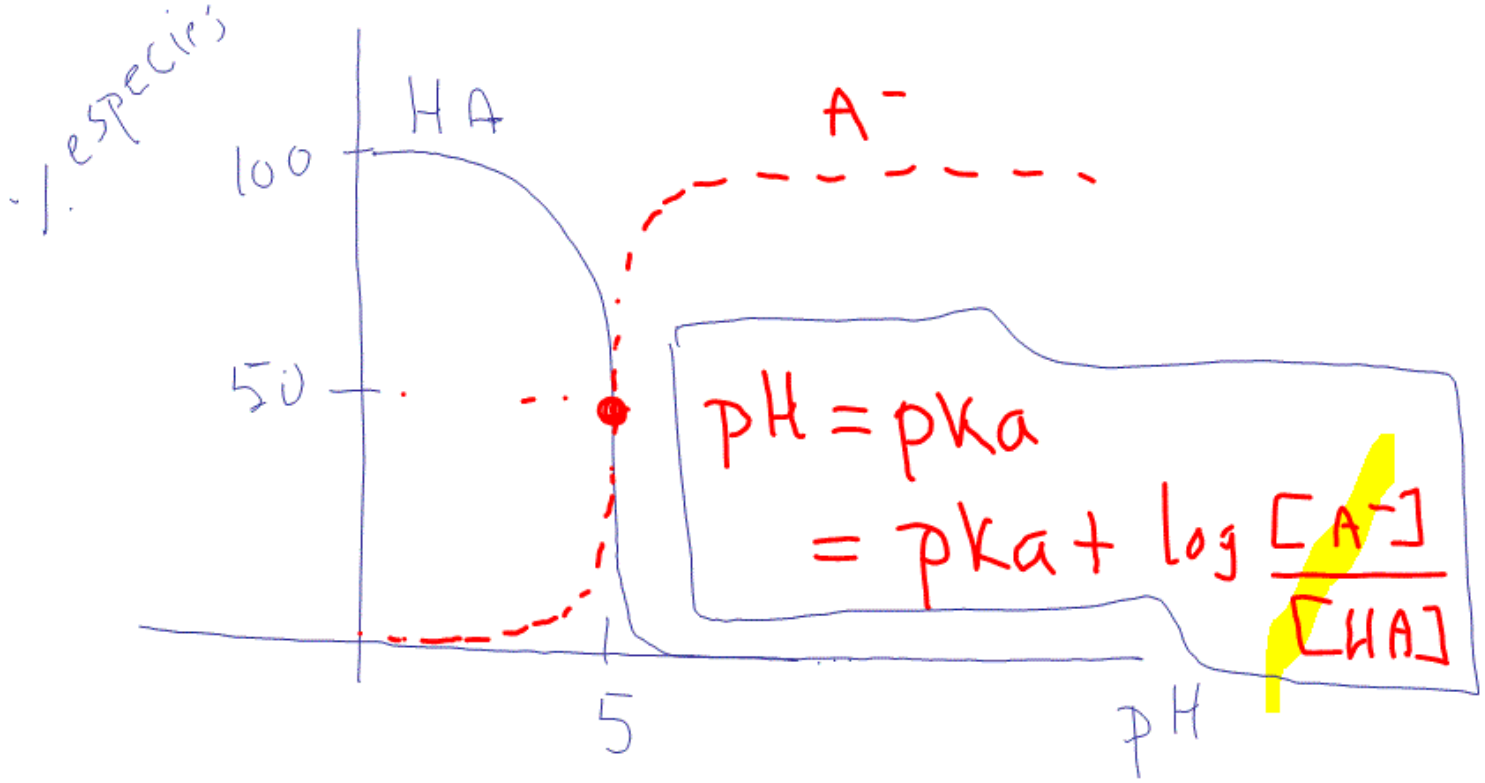
$$\%HA = \%A^- \text{ Bp } [H_3O^+]$$

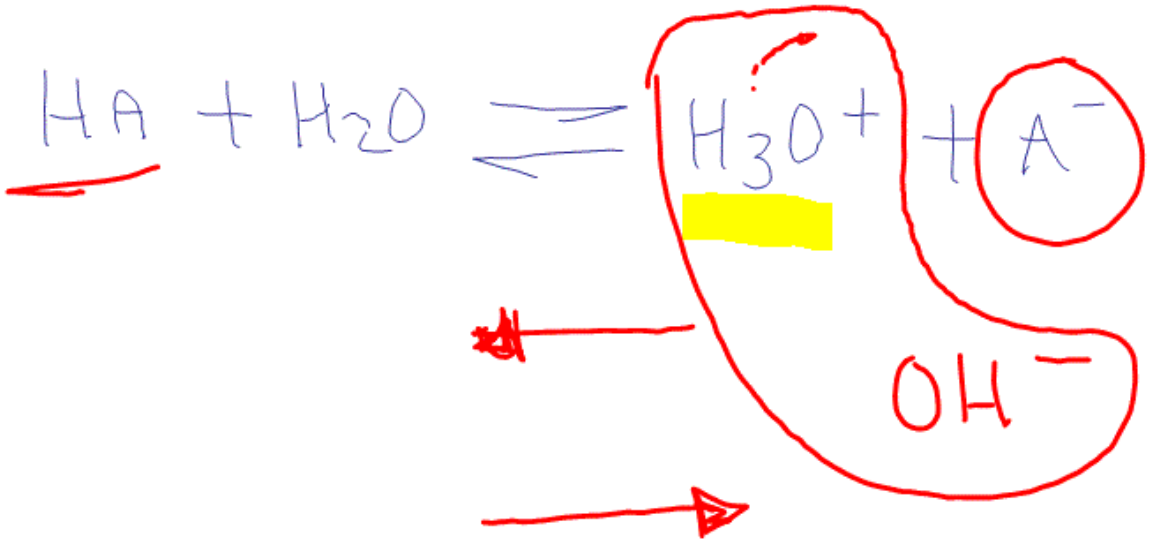
$pH = 4$

$$= 9 \%\ 10^5 \ [10^{-4}]$$

$$= 9 \%\ 10$$

$$= 91\%$$





$Ka = 10^{-5}$

$$K_{eq} = \frac{[H_3O^+][A^-]}{[HA^-]} = 10^{-5}$$

$$K_{eq} = \frac{[H_3O^+][OH^-][A^-]}{[HA^-]}$$

$$HA + OH^- \rightleftharpoons A^- + H_2O$$

$$K_{eq} = \frac{[A^-]}{[HA][OH^-]} \frac{[H_3O^+]}{[H_3O^+]}$$

$$K_{eq} = \frac{K_a}{K_w} = \frac{10^{-5}}{10^{-14}} = 10^9$$

$K_{eq\ inicial}\ 10^{-5} \longrightarrow 10^9\ K_{eq\ Final}$.

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

$$HA + H_2O \rightleftharpoons H_3O^+ + A^-$$

Inicio	C_0		
eq	$C_0(1-\alpha)$	αC_0	αC_0

$$Ka = \frac{\alpha C_o \; \alpha C_o}{C_o(1-\alpha)}$$

$$\frac{Ka}{C_o} = \frac{\alpha^2}{1-\alpha} = Fza$$

Dilución de Ostwald

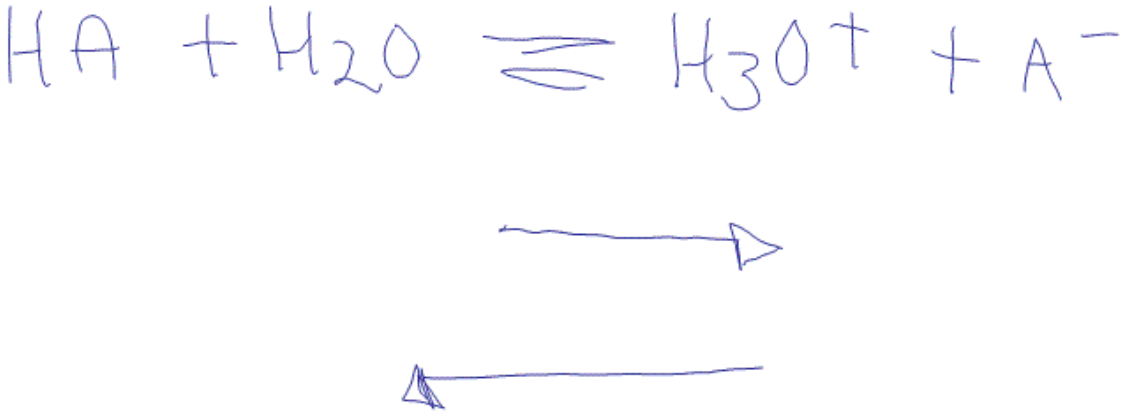
$$\frac{Ka}{Co} \geq 10^{1} = \text{ácido fte}$$

$$\frac{Ka}{Co} < 10^{-2} = \text{ácido débil}$$

$$10^{1} < \frac{Ka}{Co} < 10^{-2} \quad \text{ácido Fza media}$$

$$\frac{Ka}{Co} = \frac{10^{-5}}{10^{-2}} = 10^{-3}$$ Débil

$$= \frac{10^{-5}}{10^{-6}} = 10^{1}$$ Fuerte



$$\frac{K_b}{C_0} < 10^{-2} \quad \text{base débil}$$

$$\frac{K_b}{C_0} \geq 10^{1} \quad \text{base fte}$$

$$10^{-2} < \frac{K_b}{C_0} \leq 10^{1} \quad \text{Fza media}$$

$$B + H_2O \rightleftharpoons BH^+ + OH^-$$

$$[H_3O^+] = K_a \left\{ \frac{Ca - [H_3O^+] + [OH^-]}{Cb + [H_3O^+] - [OH^-]} \right\}$$

$$[HA] + [A^-] = Ca + Cb$$

electroneutrialidad

$$[Na^+] + [H_3O^+] = [OH^-] + [A^-]$$

$$Cb = [OH^-] + [A^-] - [H_3O^+]$$

$$[A^-] = Cb + [H_3O^+] - [OH^-]$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

$$[H_3O^+] = \frac{K_a [HA]}{[A^-]}$$

$$[H_3O^+] = K_a \frac{[HA]}{[A^-]}$$

$$[HA] = C_a + C_b - [A^-]$$

$$[HA] = C_a + C_b - \{C_b + [H_3O^+] - [OH^-]\}$$

$$[HA] = C_a - [H_3O^+] + [OH^-]$$

$$[H_3O^+] = Ka\left\{\frac{Ca - [H_3O^+] + [OH^-]}{Cb + [H_3O^+] - [OH^-]}\right\}$$

ácido débil

$$\left\{[H_3O^+] = \frac{Ka[Ca}{[H_3O^+]}\right\} -\log$$

$$\{[H_3O^+]^2 = K_a C_a\} - \log$$

$$2pH = pK_a - \log C_a$$

$$pH = \frac{1}{2} pK_a - \frac{1}{2} \log C_a$$

pH ácido débil

ácido Fte

$\{[H_3O^+] = Ca\}$ -log

$$pH = -\log Ca$$

ácido fza media

$$[H_3O^+] = Ka\left\{\frac{Ca - [H_3O^+]}{[H_3O^+]}\right\}$$

$$[H_3O^+]^2 = KaCa - Ka[H_3O^+]$$

$$[H_3O^+]^2 + Ka[H_3O^+] - KaCa = 0$$

amortiguador

$$\left\{[H_3O^+] = K_a \frac{C_a}{C_b}\right\} - \log$$

$$pH = pK_a - \log \frac{C_a}{C_b}$$

$$pH = pK_a + \log \frac{C_b}{C_a}$$

base débil

$$[H_3O^+] = Ka \left\{ \frac{\blacksquare}{Cb + [H_3O^+]} \right\}$$

$$pH = \frac{1}{2} pKw + \frac{1}{2} pKa + \frac{1}{2} \log Cb$$

base Fte

$$[H_3O^+] = \frac{}{Cb}$$

$$pH = 14 + \log Cb$$

base fza media

$$[H_3O^+] = K_a \left\{ \frac{[OH^-]}{C_b - [OH^-]} \right\}$$

$$[OH^-] = \frac{K_w}{[H_3O^+]}$$

$$[H_3O^+] = \left\{ \frac{Ka \quad Kw}{[H_3O^+] \; Cb - \frac{Kw}{[H_3O^+]}} \right\}$$

$$[H_3O^+] = \frac{Ka}{\frac{Cb\,[H_3O^+] - Kw}{[H_3O^+]}} \qquad \frac{Kw}{[H_3O^+]}$$

$$[H_3O^+] = \frac{Ka\ Kw}{Cb[H_3O^+] - Kw}$$

$$[H_3O^+]^2 Cb - Kw[H_3O^+] = KaKw$$

$$[H_3O^+]^2 Cb - Kw[H_3O^+] - KaKw = 0$$

base Fza media

$$\% A^- = \frac{[A^-]}{[A^-]+[HA]} \times 100$$

$$\% A^- = \frac{[A^-]}{[A^-]+[HA]} \times 100$$