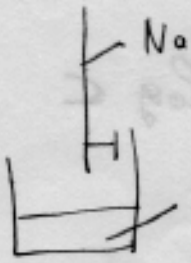
Titrages

Incertitudes : - burette si méthode colorimétrique $\sim 0{,}05$ mL
- burette $0{,}2\,\% - 0{,}5\,\%$
- méthode
- goutte $\sim 0{,}05$ mL

Acido-basique

- Acide fort par base forte



acide fort $C_0 \Rightarrow [H_3O^+] = C_0$
$n_0 = C_0 V_0$ $\quad pH = -\log C_0$

RT : $H_3O^+_{(aq)} + HO^-_{(aq)} = 2H_2O_{(l)}$ $\quad \frac{1}{K_e} = 10^{14}$ à 25°C

À l'équivalence $C V_{eq} = C_0 V_0$

$$\Rightarrow \boxed{C_0 = C \frac{V_{eq}}{V_0}}$$

quantitative + rapide
on la considère totale loin de l'équivalence

Evolution du pH

$v = 0$: $-\log C_0$

$0 < v \ll v_{eq}$: on considère la réaction totale

$H_3O^+ + HO^- = 2H_2O$

	$C_0 V_0$	/	+	/
EI	$C_0 V_0$			
EIntermédiaire	$C_0 V_0$			

$$pH = -\log\left(\frac{C(V_{eq} - v)}{V_0 + v}\right) \xrightarrow[v \to V_{eq}]{} \infty \qquad [H_3O^+] = \frac{C_0 V_0 - Cv}{V_0 + v} = \frac{C(V_{eq} - v)}{V_0 + v}$$

- $v = v_{eq}$: L'autoprotolyse domine : $2H_2O = H_3O^+ + HO^-$ $K_e \sim 10^{-14}$

$\boxed{pH = 7}$

- $v \gg v_{eq}$ Loin de l'équivalence : $[H_3O^+] \sim 0$

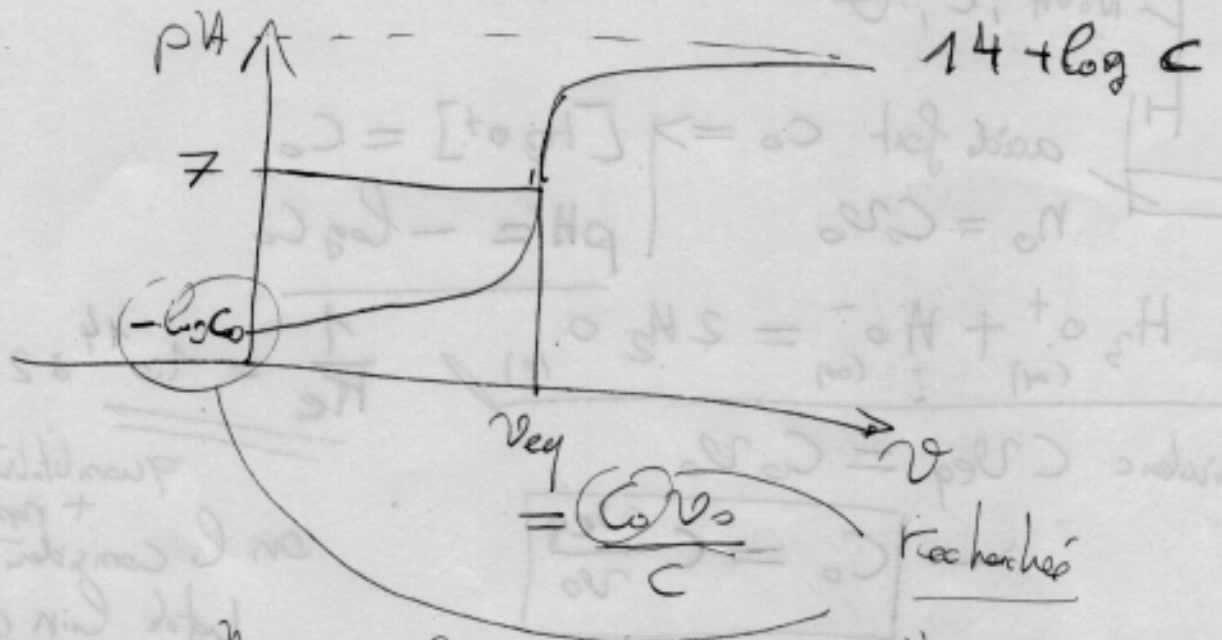
$H_3O^+ + HO^- \overset{1}{=} 2H_2O$

$\left(C(v - v_{eq}) \right) / \; : v_0 + v$

$-\log [H_3O^+]$

$\boxed{pH = -\log h = 14 + \log\left(\frac{C(v - v_{eq})}{v_0 + v}\right)}$ $h \; \frac{C(v - v_{eq})}{v_0 + v} = K_e$

$pH \to 14 + \log C$
$v \to \infty$



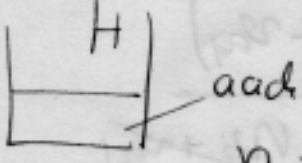
Sinon : $pH = -\log\left(\frac{C(v_{eq} - v)}{v_0 + v}\right)$ méthode de Orsen

$\sim \boxed{10^{-pH}(V_0 + v) = C(v_{eq} - v)}$

Acide faible / base forte

$$AH + HO^- = A^- + H_2O \qquad K^\circ \gg 1$$

quantitative, rapide.



$v = 0$:

$$\underset{c_0(1-\alpha)}{AH} + H_2O = \underset{\alpha c_0}{A^-} + \underset{\alpha c_0}{H_3O^+} \qquad K_A$$

$$K_A = \frac{\alpha^2 c_0^2}{c_0(1-\alpha)} \sim \alpha^2 c_0 \Rightarrow \alpha = \sqrt{\frac{K_A}{c_0}}$$

$$pH = -\log(\alpha c_0)$$

$$\boxed{pH = +\frac{1}{2}(pK_A - \log c_0)}$$

$v \ll v \ll v_{eq}$

	$AH + HO^- = A^- + H_2O$		
$c_0 v_0$	/	/	
$c_0 v_0 - cv$	/ cv	/	

$$[A^-] = \frac{cv}{v_0 + v} \qquad [AH] = \frac{c(v_{eq} - v)}{v_0 + v}$$

$$K_A = \frac{[A^-]_{eq}[H_3O^+]_{eq}}{[AH]_{eq}}$$

$$\rightarrow \boxed{pH = pK_A + \log\left(\frac{[A^-]}{[AH]}\right)} \quad \text{bis vrai.}$$

opposition $\rightarrow$

$$pH = pK_A + \log\left(\frac{cv}{c(v_{eq} - v)}\right)$$

$$\boxed{pH = pK_A + \log\left(\frac{v}{v_{eq} - v}\right)}$$

$v = v_{eq}$ $\quad [A^-] = C v_{eq}$

$$A^- + H_3O^+ = AH + H_2O \qquad K_B = \frac{K_e}{K_A}$$

$$Cv_{eq} - w \quad / \quad w \quad w$$

$$\frac{K_e}{K_A} = \frac{w^2}{Cv_{eq} - w} \cdot \frac{w^2 (v_0 + v_{eq})^2}{(Cv_{eq} - w)(v_0 + v_{eq})}$$

$$w = \sqrt{\frac{K_e}{K_A}} \sqrt{\frac{Cv_{eq}}{v_0 + v_{eq}}} \qquad hw = K_e$$

$$h = \sqrt{K_A K_e} \sqrt{\frac{v_0 + v_{eq}}{Cv_{eq}}}$$

$$pH = +\frac{1}{2}\left(pK_A + \cancel{pK_e}^{14} + \log\left(\frac{Cv_{eq}}{v_0 + v_{eq}}\right)\right)$$

$v > v_{eq}$: $\quad pH = 14 + \log\left(\frac{C(v - v_{eq})}{v_0 + v}\right)$