

CORRECTION DE L'INTERROGATION DE CHIMIE ANALYTIQUE N° 1  
PHARMACIE**Exercice 1**

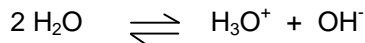
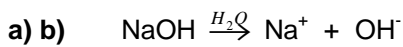
$H_2SO_4$  à 92,1 % donc dans 100 g de solution on a 92,1 g d'acide.

$$n = C_f V_f = V_i C_i$$

$$= \frac{V_i \times d}{M} \times \frac{92,1}{100}$$

$$V_i = \frac{C_f \cdot V_f \cdot M \cdot 100}{d \cdot 92,1} = \frac{1 \times 1 \times 98 \times 100}{1,83 \times 92,1} = 58,14 \text{ mL}$$

$$V_i = 58,14 \text{ mL}$$

**Exercice 2**

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

$$\frac{Ke}{[H_3O^+]} = [Na^+] + [H_3O^+]$$

a)  $[Na^+] \gg [H_3O^+]$

$$[H_3O^+] = \frac{Ke}{[Na^+]} = \frac{10^{-14}}{10^{-2}} = 10^{-12} \text{ à } 25^\circ C$$

$$pH = 12$$

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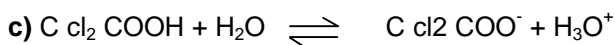
b)  $Ke - [Na^+][H_3O^+] - [H_3O^+]^2 = 0$

$$10^{-14} - 10^{-7}[H_3O^+] - [H_3O^+]^2 = 0$$

$$[H_3O^+] = 6,2 \cdot 10^{-8}$$

$$pH = 7,2$$

$$pH = 7,2$$



On néglige l'autoprotolyse de l'eau

$$K_a = \frac{[H_3O^+][C_{cl_2}COO^-]}{[C_{cl_2}COOH]} = 10^{-1,3} = \frac{[H_3O^+]^2}{C - [H_3O^+]} \Rightarrow K_a C - K_a [H_3O^+] - [H_3O^+]^2 = 0$$

$$[H_3O^+] = 3,09 \cdot 10^{-2}$$

$$pH = 1,51$$

$$pH = 1,51$$

**Exercice 3**

On calcule la concentration de  $C_6H_8O_6$  initialement dans l'eau.

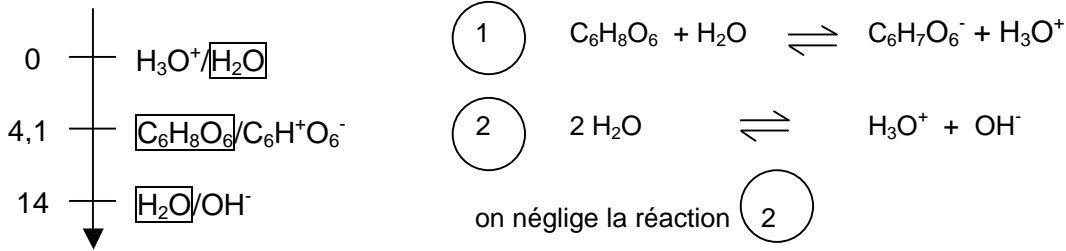
On a 1000 mg de  $C_6H_8O_6$  dans 200 mL

La concentration massique de  $C_6H_8O_6$  est donc :

$$T = \frac{1}{200 \cdot 10^{-3}} = 5 \text{ g} \cdot L^{-1}$$

De  $n = \frac{m}{M}$  on en déduit la concentration molaire de la solution

$$C = \frac{5}{176} = 2,84 \cdot 10^{-2} \text{ mol} \cdot L^{-1}$$



Soit h la concentration globale en H<sub>3</sub>O<sup>+</sup>

$$K_a = 10^{-4,1} = \frac{h^2}{c-h}$$

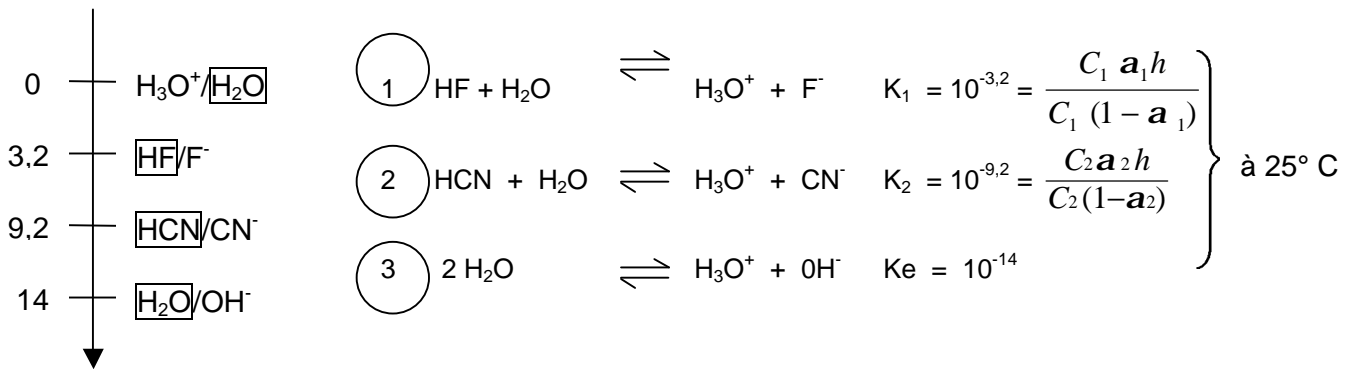
$$K_a c - K_a h - h^2 = 0$$

$$h = 1,463 \cdot 10^{-3}$$

$$pH = 2,83$$

**pH = 2,83**

**Exercice 4**



On suppose que la réaction (1) est la plus avancée d'après les K.  
Donc C<sub>1</sub> α<sub>1</sub> ≈ h

$$K_1 = \frac{h^2}{C_1 - h} \Rightarrow h_1 C_1 - K_1 h - h^2 = 0$$

$$h = 7,63 \cdot 10^{-3}$$

$$pH = 2,1$$

**pH = 2,1**

• Calcul de α<sub>1</sub>

$$h \approx C_1 \alpha_1$$

$$K_1 = \frac{C_1 a_1^2}{1-a_1} = \frac{h a_1}{1-a_1}$$

$$K_1 - \alpha_1 K_1 = h \alpha_1$$

$$\alpha_1 = \frac{K_1}{K_1 + h} = 0,0763 \text{ (7,63 \%)}$$

**α<sub>1</sub> = 0,0763**

• Calcul de α<sub>2</sub>

$$K_2 = \frac{h C_2 a_2}{C_2 (1-a_2)} = \frac{h a_2}{1-a_2}$$

L'acide est très faible, la réaction est peu avancée 1

>> α<sub>2</sub>

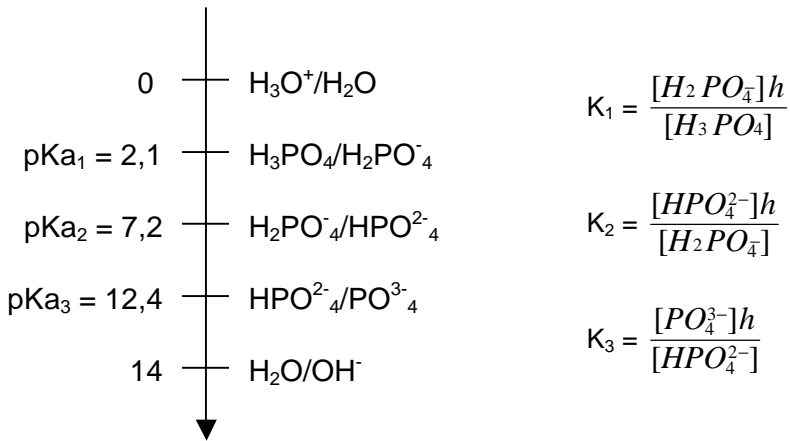
$$K_2 = h \alpha_2$$

$$\alpha_2 = \frac{K_2}{h} = 8 \cdot 10^{-8}$$

**α<sub>2</sub> = 8 · 10<sup>-8</sup>**

**Exercise 5**

$$\text{pH} = 7 \quad [\text{H}_3\text{O}^+] = 10^{-7} \text{ mol} \cdot \text{L}^{-1} = h$$



$$C_0 = 0,1 = [\text{H}_3\text{PO}_4] + [\text{H}_2\text{PO}_4^-] + [\text{HPO}_4^{2-}] + [\text{PO}_4^{3-}]$$

$$C_0 = [\text{H}_3\text{PO}_4] + [\text{H}_3\text{PO}_4] \frac{K_1}{h} + [\text{H}_3\text{PO}_4] \frac{K_1 \cdot K_2}{h^2} + [\text{H}_3\text{PO}_4] \frac{K_1 \cdot K_2 \cdot K_3}{h^3}$$

$$C_0 = [\text{H}_3\text{PO}_4] \left( 1 + \frac{K_1}{h} + \frac{K_1 K_2}{h^2} + \frac{K_1 K_2 K_3}{h^3} \right)$$

$$[\text{H}_3\text{PO}_4] = 7,7 \cdot 10^{-7} \text{ mol} \cdot \text{L}^{-1}$$

$$[\text{H}_2\text{PO}_4^-] = 0,061 \text{ mol} \cdot \text{L}^{-1}$$

$$[\text{HPO}_4^{2-}] = 0,039 \text{ mol} \cdot \text{L}^{-1}$$

$$[\text{PO}_4^{3-}] = 1,5 \cdot 10^{-7} \text{ mol} \cdot \text{L}^{-1}$$