Exercice 2 :

I.1) *On a les couples* $\begin{cases} C_6H_5COOH/C_6H_5COO^- \\ H_2O/OH^- \end{cases}$ $\quad \begin{array}{l} C_6H_5COOH \rightarrow C_6H_5COO^- + H^+ \\ H_2O + H^+ \rightarrow H_3O^+ \end{array}$

Soit la réaction: $\quad C_6H_5COOH_{aq} + H_2O_{liquide} = C_6H_5COO^-{}_{aq} + H_3O^+{}_{aq}$

$C(C_6H_5COOH) = 5,00.10^{-3} \, mol.L^{-1} = 5,00.10^{-3} \, mol.(10^{-3}m^3)^{-1} = 5,00.\,mol.m^{-3}$

x en moles		$C_6H_5COOH_{aq}$	$H_2O_l \rightleftarrows C_6H_5COO^-{}_{aq}$		$H_3O^+{}_{aq}$
Etat initial	0	$5,00.V$	excès	0	0
Etat intermédiaire	x	$5,00.V - x$	excès	x	x
Etat équilibre	x_{eq}	$5,00.V - x_{eq}$	excès	x_{eq}	x_{eq}

I.2) $\sigma = \sum \lambda_i[X_i] \quad donc \quad \sigma = \lambda_{C_6H_5COO^-}[C_6H_5COO^-]_{eq} + \lambda_{H_3O^+}[H_3O^+]_{eq}$

$or \; [C_6H_5COO^-]_{eq} = [H_3O^+]_{eq} = \dfrac{x_{eq}}{V} \Rightarrow \dfrac{x_{eq}}{V}\left(\lambda_{C_6H_5COO^-} + \lambda_{H_3O^+}\right) \rightarrow \dfrac{x_{eq}}{V} = \dfrac{\sigma}{\lambda_{C_6H_5COO^-} + \lambda_{H_3O^+}}$

$213\mu S.cm^{-1} = 213 * 10^{-3}mS * (10^{-2}m)^{-1} = 213 * 10^{-3}.mS.10^2 m^{-1} = 21,3 \, mS.m^{-1}$

$\dfrac{x_{eq}}{V} = \dfrac{21,3}{35 + 3.24} = \dfrac{21,3}{38,24} = 5.57.10^{-1} \, mol.m^{-3}$

$[C_6H_5COO^-] = [H_3O^+] = \dfrac{x_{eq}}{V} = 5.57.10^{-1} \, mol.m^{-3}$

$[C_6H_5COOH] = \dfrac{5V - x_{eq}}{V} = 5 - \dfrac{x_{eq}}{V} = 5 - 5.57.10^{-1} = 4.44 \, mol.m^{-3}$

I.3) $K_A = \dfrac{[C_6H_5COO^-] * [H_3O^+]}{[C_6H_5COOH]} = \dfrac{(5.57.10^{-1})^2}{4.44} = 6.99.10^{-2}$

$\rightarrow \; pK_A = -Log(K_A) = -Log(6.99.10^{-2}) = -0.844 \; ????$