1

$$HCN + H_2O \underset{}{\overset{Ka}{\rightleftarrows}} CN^- + H_3O^+$$

$C(1-\alpha)$ $\quad C\alpha \quad C\alpha$

$$Ka = \frac{[CN^-][H_3O^+]}{[HCN]}$$

$$\therefore [HCN] = \frac{[CN^-][H_3O^+]}{Ka}$$

$$= \frac{(10^{-4.0})^2}{7.2\times10^{-10}} = 13.88 \fallingdotseq 13.9 \ (mol/\ell)$$

)1M過去問解答

2.

イオン独立移動の法則より

$\Lambda_0(HCl) = \Lambda(H^+) + \Lambda(Cl^-) = 426.1 \times 10^{-4} (\Omega^{-1} m^2 mol^{-1})$ ・・・①

$\Lambda_0(NaCl) = \Lambda(Na^+) + \Lambda(Cl^-) = 126.5 \times 10^{-4} (\Omega^{-1} m^2 mol^{-1})$ ・・・②

$\Lambda_0(C_2H_5COONa) = \Lambda(Na^+) + \Lambda(C_2H_5COO^-) = 85.9 \times 10^{-4} (\Omega^{-1} m^2 mol^{-1})$ ・・・③

①+③−②より,

$\Lambda_0(HCl) + \Lambda_0(C_2H_5COONa) - \Lambda_0(NaCl) = \Lambda(H^+) + \Lambda(C_2H_5COO^-)$

$= \Lambda_0(C_2H_5COOH)$

$= 385.5 \times 10^{-4} (\Omega^{-1} m^2 mol^{-1})$ ・・・④

また,プロピオン酸の解離度をαとおくと,

$$\alpha = \frac{\Lambda}{\Lambda_0} = \frac{31.66 \times 10^{-4}}{385.5 \times 10^{-4}} = 0.0821 \quad \cdots ⑤$$

よって$C = 1.865 \times 10^{-3} (mol\,dm^{-3})$とおくと,

$C_2H_5COOH + H_2O \underset{}{\overset{Ka}{\rightleftarrows}} C_2H_5COO^- + H_3O^+$ より(Ka:解離定数)

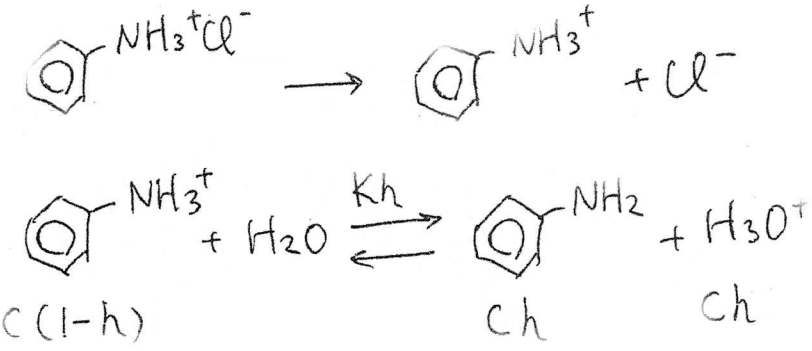
$C(1-\alpha)$　　$C\alpha$　　$C\alpha$

$$Ka = \frac{[C_2H_5COO^-][H_3O^+]}{[C_2H_5COOH]} = \frac{(C\alpha)^2}{C(1-\alpha)} \fallingdotseq C\alpha^2 \quad (\because 1-\alpha \fallingdotseq 1)$$

よってC,αを代入して

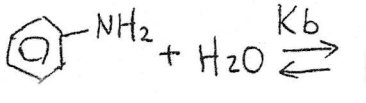
$Ka = 125.70 \times 10^{-7} = 1.257 \times 10^{-5}$

3.



$$K_h = \frac{[C_6H_5NH_2][H_3O^+]}{[C_6H_5NH_3^+]} = \frac{K_w}{\frac{[C_6H_5NH_3^+][OH^-]}{[C_6H_5NH_2]}} = \frac{K_w}{K_b} = \frac{10^{-14}}{4.0\times10^{-10}}$$

$$= 2.5\times10^{-5}$$

(∵ )

また、$1-h \fallingdotseq 1$ なので

$$K_h = ch^2$$

$$h^2 = 2.5\times10^{-4}$$

$$h = 1.58\times10^{-2}$$

$$h \fallingdotseq 1.6\times10^{-2}$$

$$[H_3O^+] = ch = \sqrt{cK_h}$$

$$= \sqrt{2.5\times10^{-6}}$$

$$= 1.58\times10^{-3}$$

$$\fallingdotseq 1.6\times10^{-3}$$