

①

HCl ACIDO FORTE

$$[H_3O^+] = [HCl]$$

$$\begin{aligned} pH &= -\log([HCl]) \\ &= -\log(0.0075) \\ &= \underline{\underline{2.1}} \end{aligned}$$



CONCENTRAZIONE $[OH^-]$?

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

$$[OH^-] = K_w / [H_3O^+] = \frac{10^{-14}}{0.0075}$$

$$= 1.3 \cdot 10^{-12} \text{ M}$$

②

BANAL METE RICORDIAMO

$$K_w = K_a K_b \quad \text{PER COPPIE CONIUGATE}$$

$$K_b = K_w / K_a$$

$$-\log(K_b) = -\log(K_w / K_a)$$

$$pK_b = -\log(K_w) + (\log K_a)$$

$$= 14 - pK_a$$

$$= 14 - 9.80$$

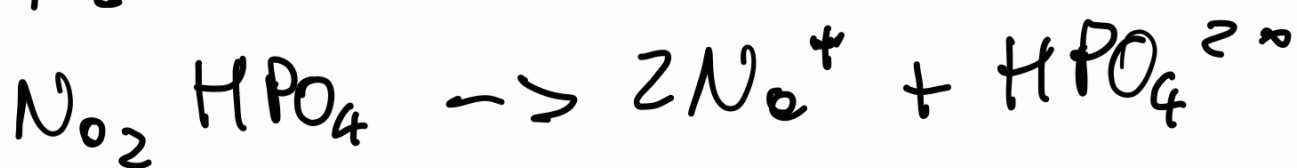
$$= \underline{\underline{4.2}}$$

[NOTA

$$\log(K_w) = \log(10^{-14}) = -14$$

$$K_b = 10^{-4.2} = \underline{\underline{6.3 \cdot 10^{-5}}}$$

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QUINDI :

Na^+ ACIDO CON. BASE FORTE
NON ACIDO

OH^- BASE FORTE

HPO_4^{2-} ACIDO DEBOLE (H_3PO_4
ACIDO TRIPROTICO MEDIA
FORZA)



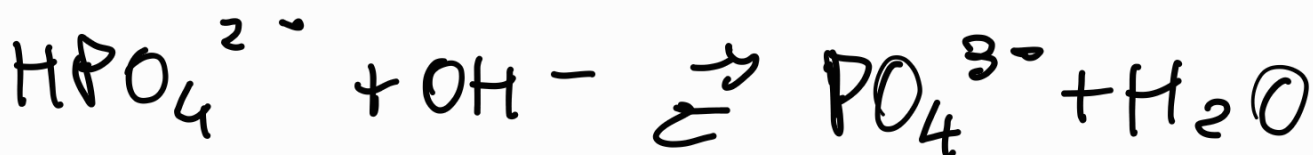
b) $K_{a3}(HPO_4^{2-}) = 4.5 \cdot 10^{-13}$

$$K_b(PO_4^{3-}) = K_w / K_{a3} = 2.2 \cdot 10^{-2}$$

K_b REAZIONE



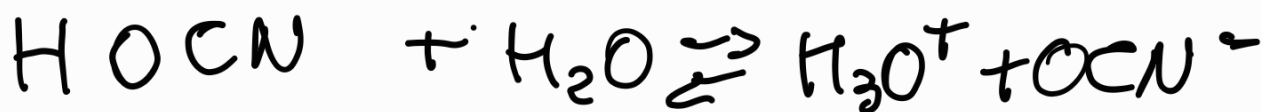
quindi LA K DELLA REAZIONE



$$1/K_b = 4.5 \cdot 10^1$$

SPOSTATA VERSO I PRODOTTI

④ e) $pH = 2.67$



$$[H_3O^+] = 10^{-2.67} = 0.0021 \text{ M}$$

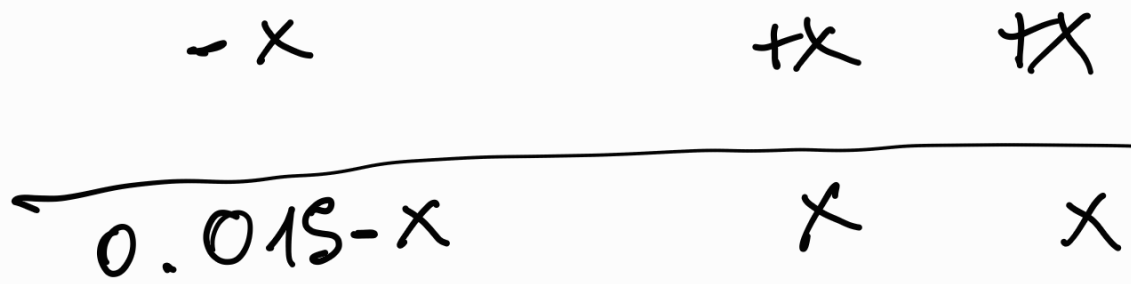
b)



$$0.015$$

$$0$$

$$0$$



$$K_e = \frac{[H^+][OCN^-]}{[HOCN]}$$

$$= \frac{x^2}{0.015 - x}$$

$$x = [H_3O^+] = 0.0021 \text{ M}$$

$$K_e = \frac{(0.0021)^2}{0.015 - 0.0021} = 3.4 \cdot 10^{-4}$$

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$$[HCN] = 0.025 \text{ M}$$

$$K_e = 4 \cdot 10^{-10}$$



$$[\text{H}_3\text{O}^+] = [\text{CN}^-]$$

TRATTAZIONE ESATTA

$$K_a = \frac{x^2}{[\text{HCN}]_0 - x} \quad \text{DA CUI}$$

$$x^2 + K_a \cdot x - [\text{HCN}]_0 \cdot K_a = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\begin{aligned} a &= 1 \\ b &= 4.0 \cdot 10^{-10} \\ c &= -1.0 \cdot 10^{-4} \end{aligned}$$

$$\boxed{\begin{aligned} x_1 &= 3.16 \cdot 10^{-6} \\ x_2 &= -3.16 \cdot 10^{-6} \end{aligned}}$$

APPROSSIMATA

$$[\text{H}_3\text{O}^+] = \sqrt{K_a \cdot [\text{HCN}]_0}$$

PERCHÉ $[\text{HCN}]_0 - x \approx [\text{HCN}]_0$

$$K_a = \frac{x^2}{[\text{HCN}]_0}$$

$$x = \pm \sqrt{K_a [\text{HCN}]_0}$$

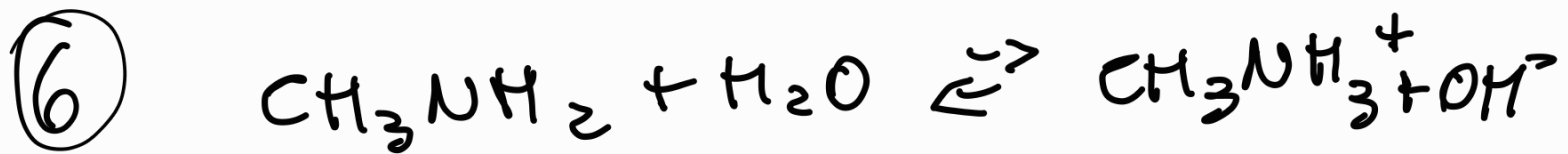
$$x = \pm 3.16 \cdot 10^{-6}$$

Quindi :

$$\underline{[H_3O^+] = [CN^-] = 3.16 \cdot 10^{-6} M}$$

$$\underline{[HCN] = [HCN]_0 = 0.025 M}$$

$$\underline{pH = -\log(3.16 \cdot 10^{-6}) = 5.5}$$



$$[CH_3NH_2] = 0.25 M \quad K_b = 4.2 \cdot 10^{-4}$$

$$[OH^-] = \sqrt{K_b \cdot [CH_3NH_2]_0} = 0.0102 M$$

$$pOH = -\log([OH^-]) = 2.0$$

$$pH = 14 - pOH = 12$$

⑦ 10.0 gr di NaCN

$$V = 5.00 \cdot 10^2 \text{ mL}$$

$$\begin{aligned} \text{PM} &= 23 + 12.01 + 14.01 \\ &= 49.02 \text{ g/mol.} \end{aligned}$$

$$M_{\text{NaCN}} = \frac{10.0}{49.02} = 0.22 \text{ mol/l}$$

$$\begin{aligned} [\text{NaCN}] &= [\text{CN}^-] = \frac{0.22}{0.5} \\ &= 0.44 \text{ M} \end{aligned}$$



$$K_b = \frac{K_w}{K_a(\text{HCN})} = 2.5 \cdot 10^{-5}$$

$$[\text{OH}^-] = \sqrt{K_b [\text{CN}^-]_0} = 0.0033 \text{ M}$$

$$[H_3O^+] = K_w / [OH^-] = \underline{\underline{3.03 \cdot 10^{-12} M}}$$

Quindi:

$$[NO^+] = [CN^-] = 0.44 M$$

$$[OH^-] = 0.0033 M$$

$$[HCN] = [OH^-] = 0.0033 M$$

$$[H_3O^+] = 3.03 \cdot 10^{-12} M$$