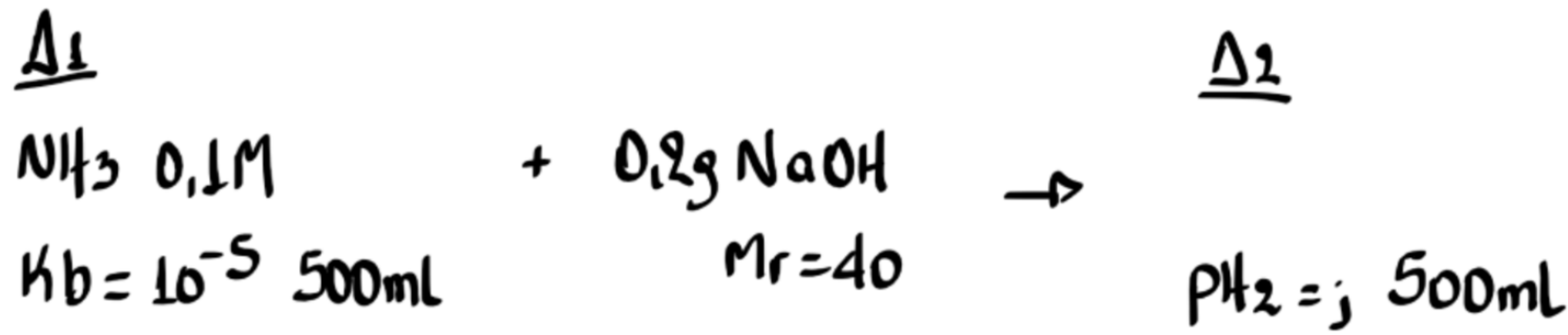


Άσκηση 9.13.



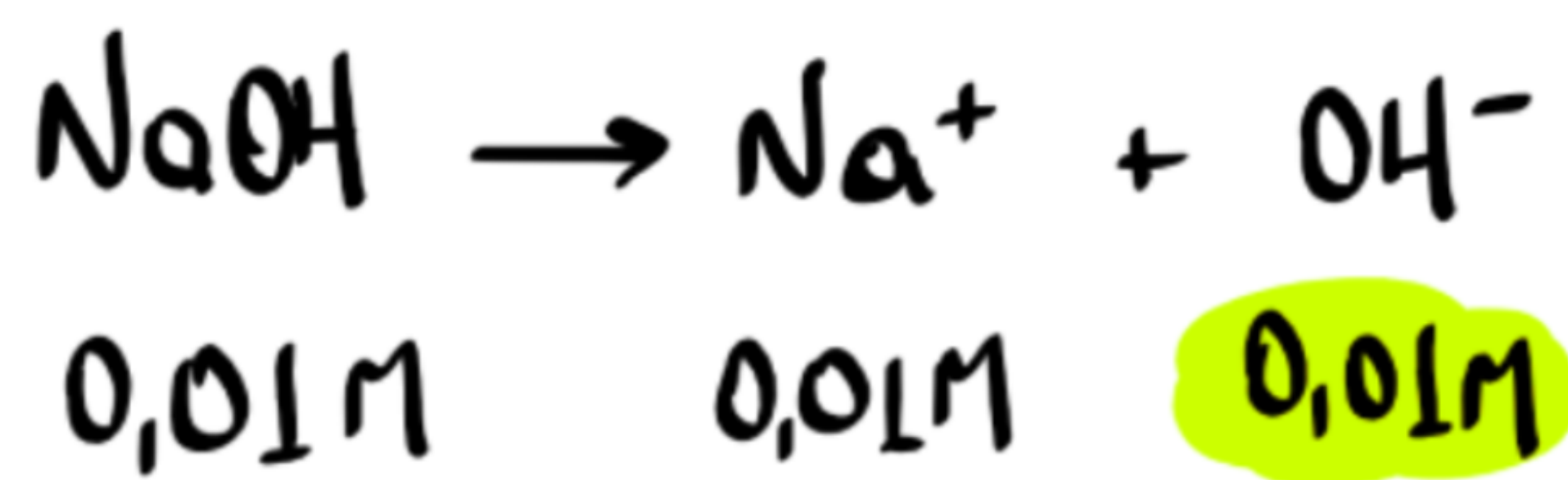
a)  $\text{pH} = 11, \alpha = 0,01$

b)  $\text{NaOH: } \eta = \frac{0,2}{40} = 0,005\text{mol}$

Δε: Τα βιολικά δεν αντιδρούν μεταξύ τους:

$$[\text{NH}_3] = 0,1\text{M}$$

$$[\text{NaOH}] = \frac{0,005}{0,5} = 0,01\text{M}$$



$$K_b = \frac{x \cdot (x+0,01)}{0,1-x} \approx \frac{x \cdot 0,01}{0,1}$$

$$10^{-5} = x \cdot 10^{-1}$$

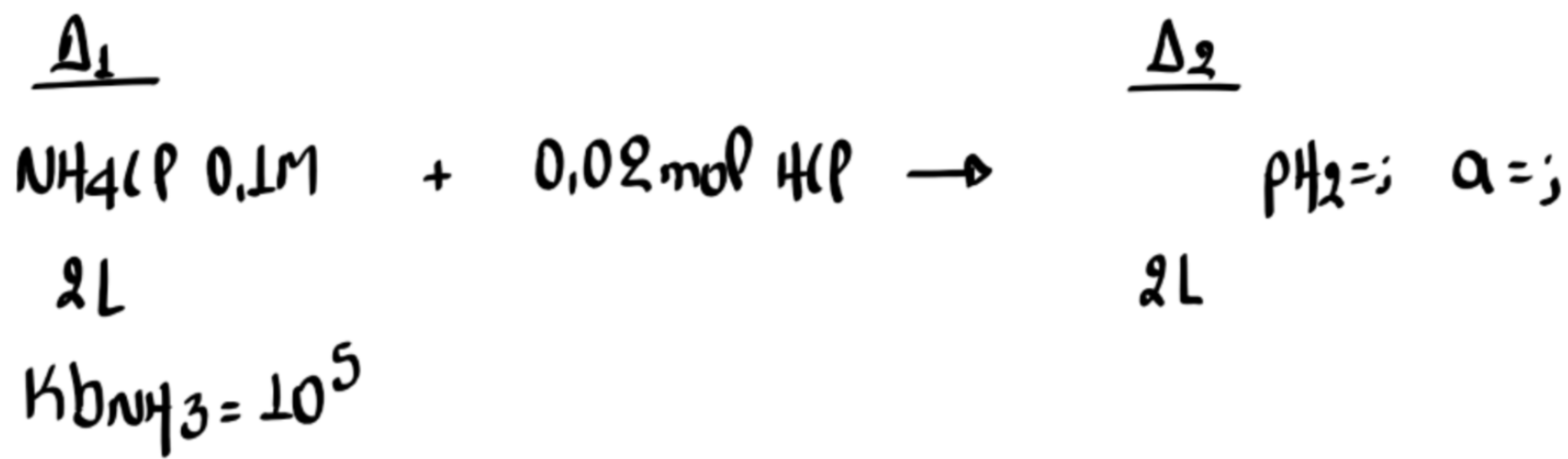
$$x = 10^{-4}$$

$$[\text{OH}^-]_{\text{ολ}} = x + 0,01 = 10^{-4} + 0,01 \approx 0,01\text{M} \Rightarrow \text{pOH} = 2$$

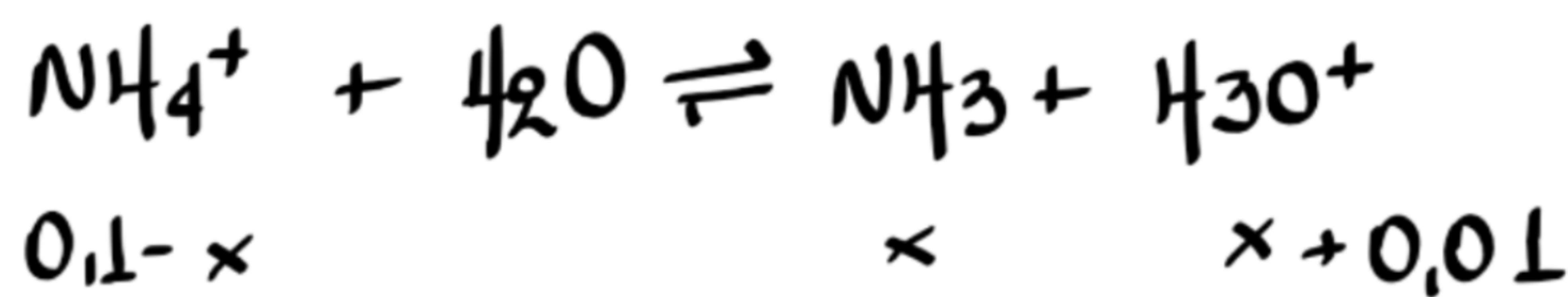
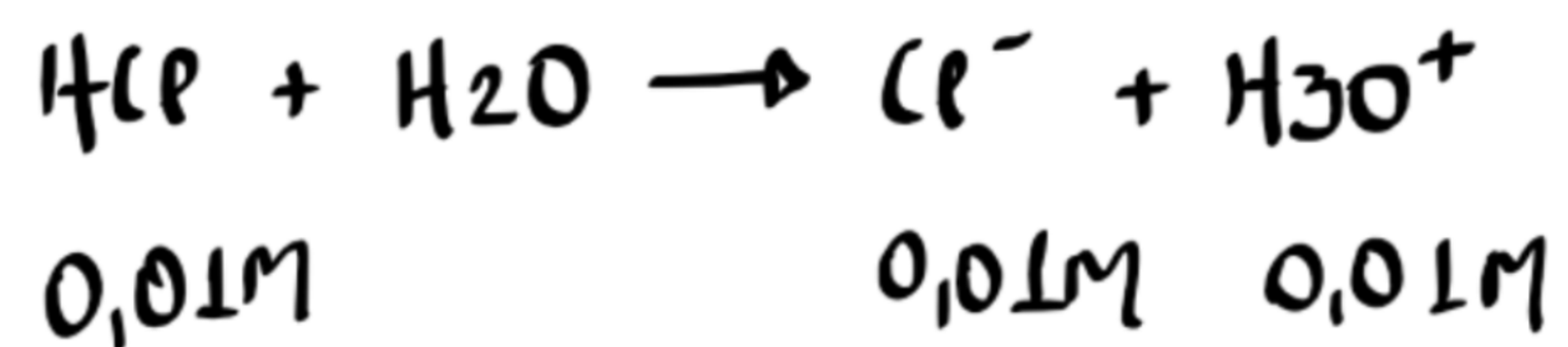
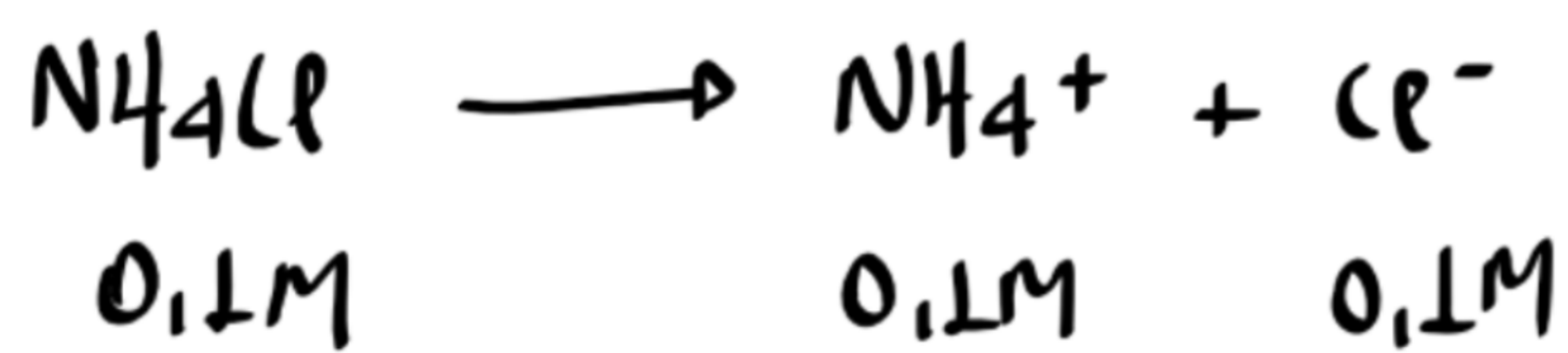
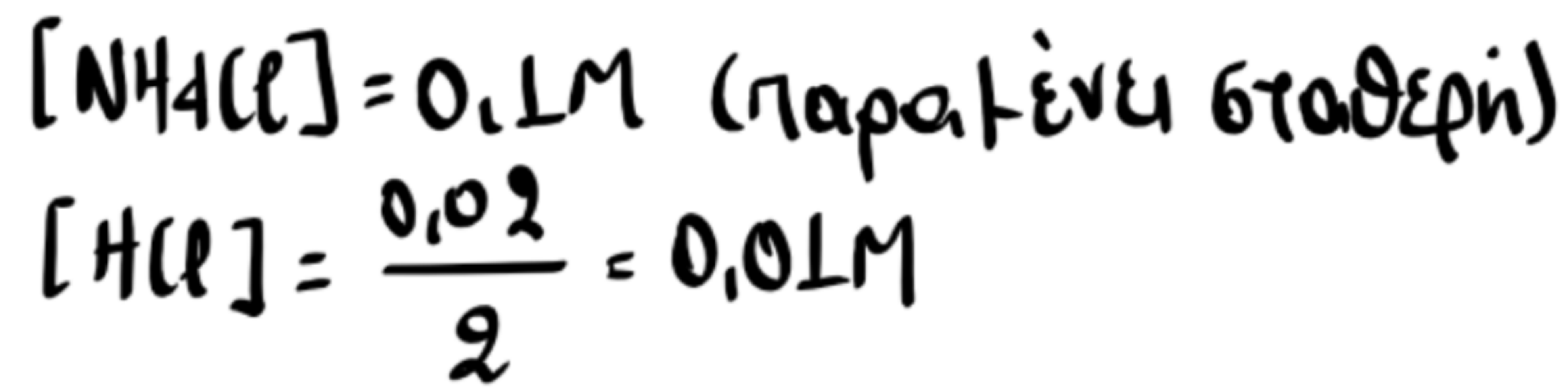
$$\text{pH} = 12 \text{ στους } 25^\circ\text{C}$$

$$\alpha = \frac{x}{0,1} = \frac{10^{-4}}{10^{-1}} = 10^{-3}$$

Άσκηση 9.14.



$\Delta_2$ : Τα βιολικά δεν αντιδρούν μεταξύ τους. (έχουμε 16 κύριο οξύ και άλας αβθ. οξέος)  
Οησίε:



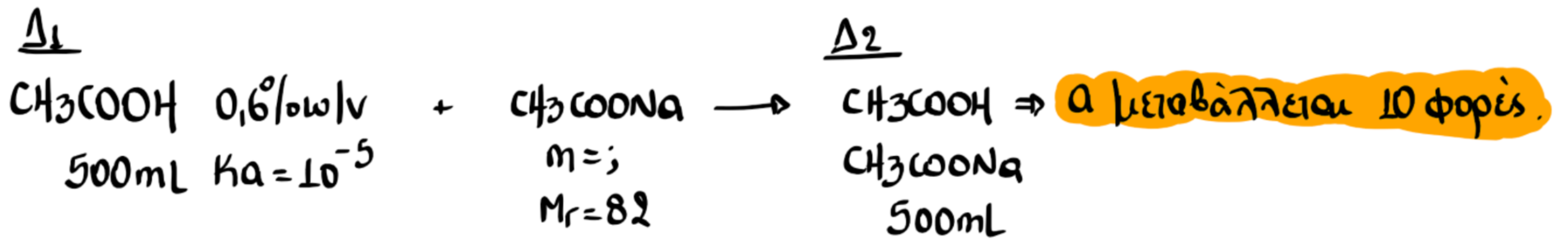
$$K_a\text{NH}_4^+ = \frac{K_w}{K_b} = \frac{10^{-14}}{10^{-5}} = 10^{-9} \Rightarrow K_a\text{NH}_4^+ = \frac{x \cdot (x+0,01)}{0,1-x} \approx \frac{x \cdot 0,01}{0,1}$$

$$\Rightarrow 10^{-9} = x \cdot 10^{-1} \Rightarrow x = 10^{-8}$$

$$\text{! } [\text{H}_3\text{O}^+]_{\text{ολ}} = x + 0,01 = 10^{-8} + 0,01 \approx 0,01\text{M} \quad \text{pH} = 2$$

$$\alpha = \frac{x}{0,1} = \frac{10^{-8}}{10^{-1}} = 10^{-7}$$

Άσκηση 9.15.



Δ1: Υπολογίζω την συγκέντρωση του CH<sub>3</sub>COOH:

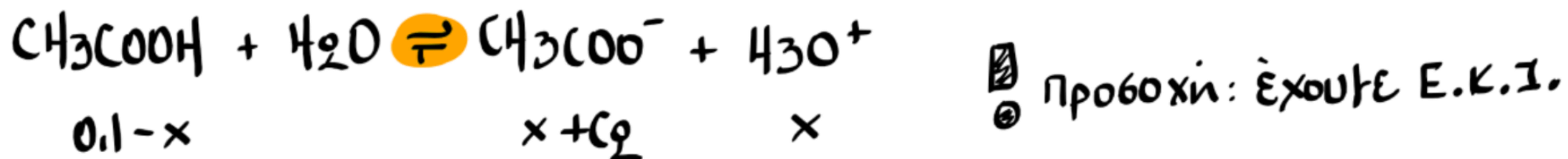
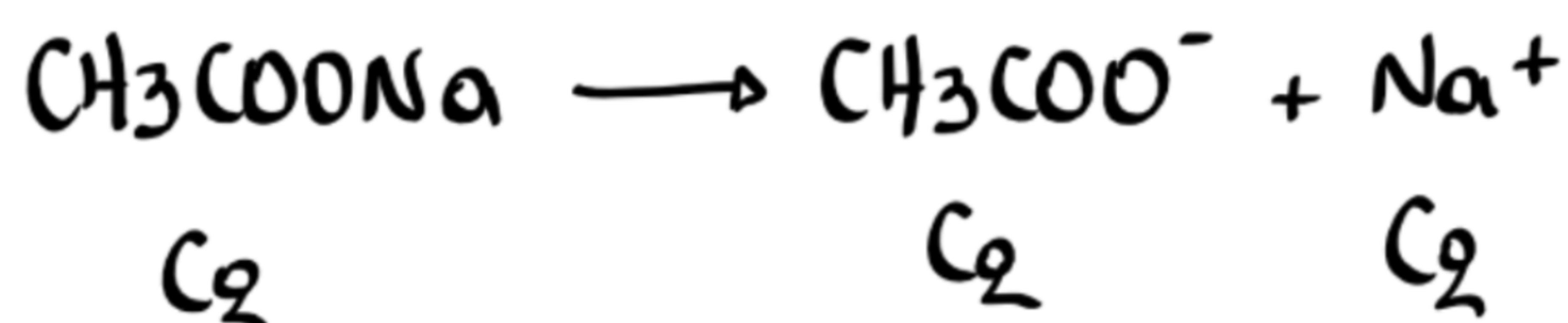
$$C = \frac{m}{M_r \cdot V} \Rightarrow C = \frac{0,6}{60 \cdot 0,1} = \frac{0,6}{6} = 0,1\text{M}$$

$$K_a = \frac{a^2 \cdot C}{1-a} \approx a^2 \cdot C \Rightarrow 10^{-5} = a^2 \cdot 10^{-1} \Rightarrow a^2 = 10^{-4} \Rightarrow a_1 = 10^{-2}$$

Δ2: Τα σώματα δεν αντιδρούν μεταξύ τους.

$$[\text{CH}_3\text{COOH}] = 0,1\text{M}$$

$$[\text{CH}_3\text{COONa}] = C_2 = ;$$



Λόγω Ε.Κ.Ι. ο βαθμός ιοντισμού μειώνεται, οπότε:  $a_2 = \frac{a_1}{10} = \frac{10^{-2}}{10} = 10^{-3}$

$$\text{Έχετε τη σχέση: } K_a = \frac{(x+C_2) \cdot x}{0,1-x} \approx \frac{C_2 \cdot x}{0,1} \Rightarrow 10^{-5} = \frac{C_2 \cdot x}{10^{-1}} \Rightarrow C_2 \cdot x = 10^{-6} \quad (1)$$

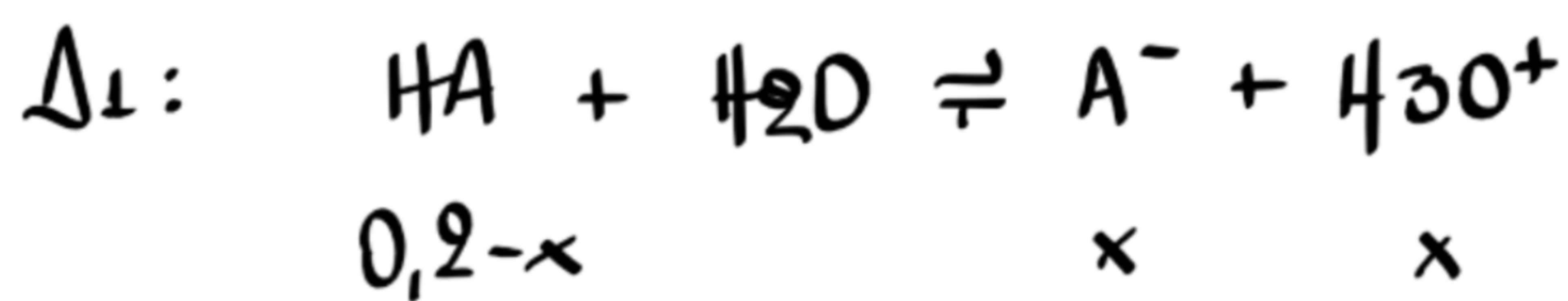
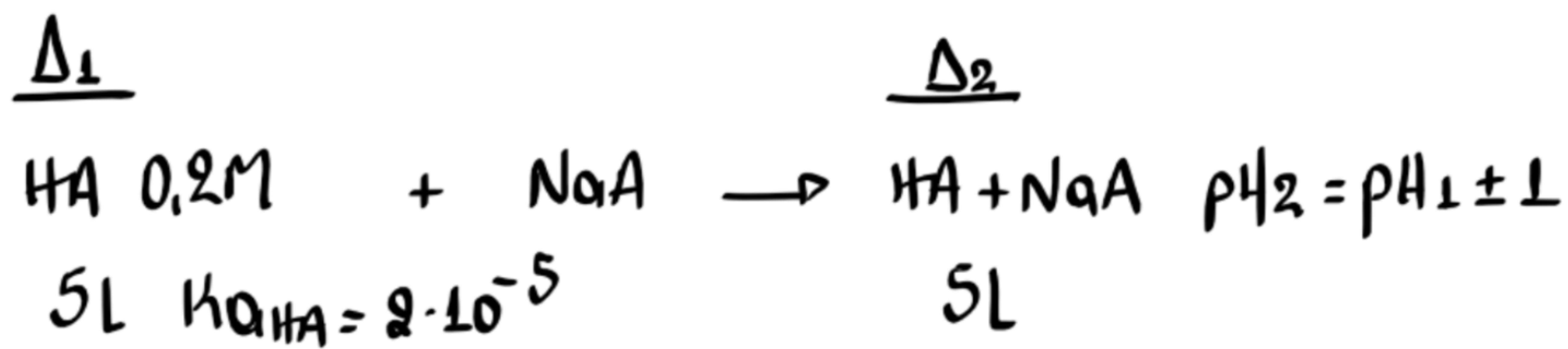
$$\text{Επίσης έχουμε τη σχέση: } a = \frac{x}{0,1} \Rightarrow 10^{-3} = \frac{x}{10^{-1}} \Rightarrow x = 10^{-4}$$

$$\text{στην (1): } C_2 \cdot 10^{-4} = 10^{-6} \Rightarrow \underline{C_2 = 10^{-2}\text{M}} \text{ CH}_3\text{COONa}$$

$$C_2 = \frac{m}{M_r \cdot V} \Rightarrow 10^{-2} = \frac{m}{82 \cdot 0,5} \Rightarrow m = 0,01 \cdot 82 \cdot 0,5 = 0,41\text{g}$$

$$[\text{H}_3\text{O}^+] = x = 10^{-4}\text{M} \Rightarrow \text{pH} = 4$$

Άσκηση 9.16.



$$K_{\text{a}} = \frac{x^2}{0,2-x} \approx \frac{x^2}{0,2} \Rightarrow 2 \cdot 10^{-5} = \frac{x^2}{0,2} \Rightarrow x = \underline{2 \cdot 10^{-3}}$$

$$\text{pH}_1 = -\log 2 \cdot 10^{-3} = -\log 2 - \log 10^{-3} \Rightarrow \underline{\text{pH}_1 = 3 - \log 2}$$

$\Delta_2$ : Με προσθήκη NaA έχουμε Ε.Κ.1. Στο  $\text{A}^-$  οπότε  $\downarrow [\text{H}_3\text{O}^+]$  άρα  $\text{pH} \uparrow$

$$\text{pH}_2 = \text{pH}_1 + 1 = 3 - \log 2 + 1 = 4 - \log 2 \Rightarrow \text{pH}_2 = 4 - \log 2 = -\log 10^{-4} - \log 2$$

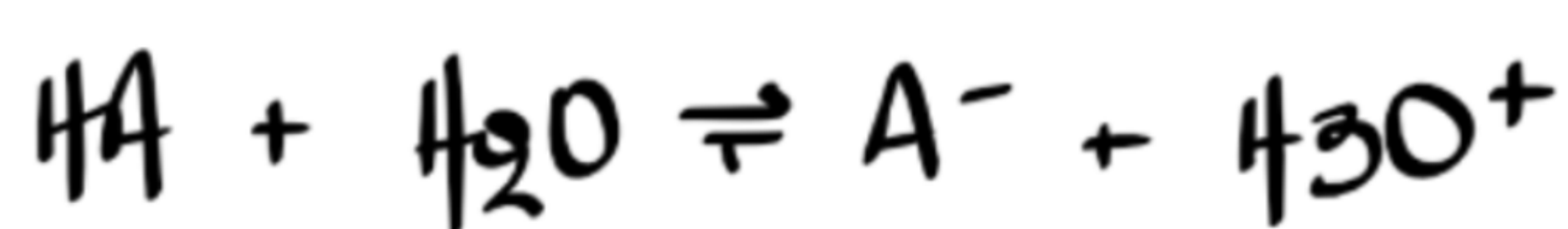
$$\Rightarrow \text{pH}_2 = -\log 2 \cdot 10^{-4}$$
$$\Rightarrow \underline{[\text{H}_3\text{O}^+] = 2 \cdot 10^{-4} \text{M}}$$

Οπότε νέες συγκεντρώσεις:

$$C_{\text{NaA}} = \frac{n}{V} = C'_2 \quad ? \quad C_{\text{HA}} = 0,2\text{M} \text{ (βλ. αθ)}$$



$$C'_2 \qquad \qquad C'_2 \qquad C'_2$$



$$0,2-x \qquad \qquad x + C'_2 \qquad x = 2 \cdot 10^{-4}$$

$$K_{\text{aHA}} = \frac{(x + C'_2) \cdot x}{0,2-x} \approx \frac{C'_2 \cdot x}{0,2} \Rightarrow 2 \cdot 10^{-5} = \frac{C'_2 \cdot 2 \cdot 10^{-4}}{0,2} \Rightarrow C'_2 = 0,02 \text{M}$$

$$\underline{\text{Άρα:}} \quad C'_2 = \frac{n'_2}{V} \Rightarrow 0,02 = \frac{n'_2}{5} \Rightarrow n'_2 = 0,1 \text{ mol.}$$