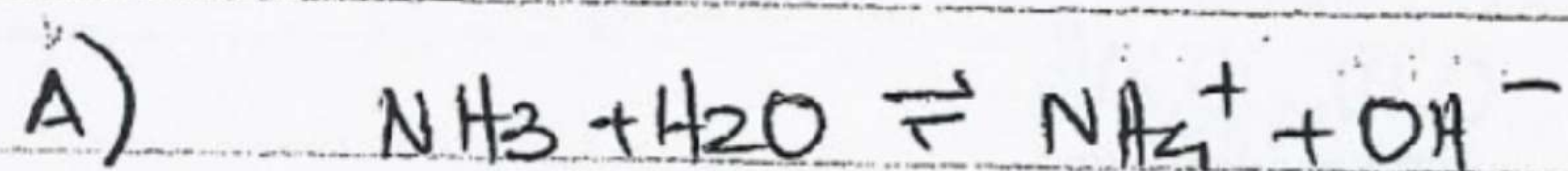


11.12

Δ1

NH₃

pH=11,5, K_b=10⁻⁵



C-x x x = 10^{-2,5} pH=11,5 ⇒ pOH=2,5

$$K_{b\text{NH}_3} = \frac{x^2}{C-x} \approx \frac{x^2}{C} \Rightarrow 10^{-5} = \frac{x^2}{C} \Rightarrow 10^{-5} = \frac{(10^{-2,5})^2}{C} \Rightarrow C_{\text{NH}_3} = 1\text{M}$$

C-x ≈ C ισχύει καθώς [NH₃] >> [OH⁻] δηλ. C >> x.

B)

Δ1

NH₃ 1M

2L

+ NH₄NO₃

Δ2

NH₃ + NH₄NO₃

2L, pH=10

Δ1: n_{NH₃} = 1 · 2 = 2 mol

Δ2: κατά την προσθήκη NH₄NO₃ στο Δ1 προκύπτει ουδέτερο Δ2.
θεωρούμε... έχω χρησιμοποιήσει τη σχέση των Henderson-Hasselbalch:

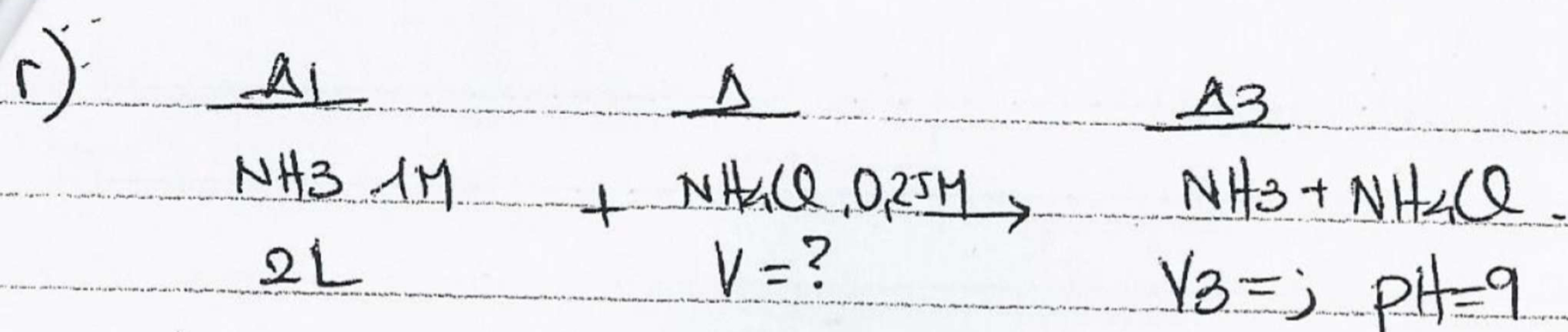
$$\text{pOH} = \text{pK}_b + \log \frac{C_{\text{OH}^-}}{C_{\text{B}}} \Rightarrow 4 = 5 + \log \frac{C_{\text{OH}^-}}{C_{\text{B}}} \Rightarrow$$

$$\Rightarrow -1 = \log \frac{C_{\text{OH}^-}}{C_{\text{B}}} \Rightarrow \log 10^{-1} = \log \frac{C_{\text{OH}^-}}{C_{\text{B}}} \Rightarrow \frac{C_{\text{OH}^-}}{C_{\text{B}}} = 0,1$$

$$\Rightarrow \frac{C_{\text{NH}_4\text{NO}_3}}{C_{\text{NH}_3}} = 0,1 \Rightarrow C_{\text{NH}_4\text{NO}_3} = 0,1 \cdot \frac{n_{\text{NH}_3}}{2} \Rightarrow C_{\text{NH}_4\text{NO}_3} = 0,1 \cdot \frac{2}{2}$$

$$\Rightarrow \left. \begin{array}{l} C_{\text{NH}_4\text{NO}_3} = 0,1 \text{ M} \\ M_r \text{ NH}_4\text{NO}_3 = 80 \end{array} \right\} C = \frac{m}{M_r \cdot V} \Rightarrow m = 0,1 \cdot 80 \cdot 2 = 16 \text{ g}$$

(... οι προϋποθέσεις ισχύουν.)



$\Delta_1 \quad n_{\text{NH}_3} = 1 \cdot 2 = 2 \text{ mol}$

$\Delta_{\text{NH}_4\text{Cl}} \quad n_{\text{NH}_4\text{Cl}} = 0,25 \cdot V$

Δ_3 : θεωρούμε ότι ισχύουν οι προϋποθέσεις...

$$\text{pOH} = \text{p}K_b + \log \frac{C_{\alpha}}{C_{\beta}} \Rightarrow 5 = 5 + \log \frac{C_{\alpha}}{C_{\beta}}$$

$$\Rightarrow 0 = \log \frac{C_{\alpha}}{C_{\beta}} \Rightarrow C_{\alpha} = C_{\beta}$$

$$\Rightarrow \frac{n_{\text{NH}_4\text{Cl}}}{V_3} = \frac{n_{\text{NH}_3}}{V_3} \Rightarrow n_{\text{NH}_4\text{Cl}} = 2 \text{ mol}$$

Άρα:

$$C_{\text{NH}_4\text{Cl}} = \frac{n_{\text{NH}_4\text{Cl}}}{V} \Rightarrow V = \frac{2}{0,25} = 8 \text{ L}$$