

Απαντήσεις

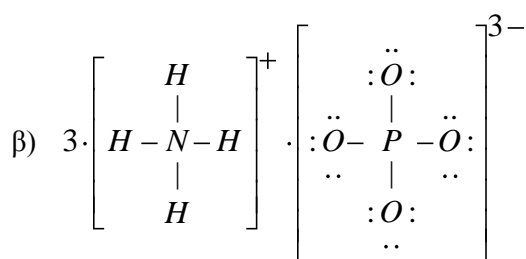
ΘΕΜΑ Α

A1 → γ , A2 → δ , A3 → α , A4 → β , A5 (i) → γ , (ii) κόκκινο

ΘΕΜΑ Β

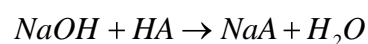
B1 α)

στοιχείο	Ηλεκτρονιακή δομή	Ομάδα	περίοδος
${}_1\text{H}$	$1s^1$	1^n	1^n
${}_7\text{N}$	$1s^2 2s^2 2p^3$	15^n	2^n
${}_8\text{O}$	$1s^2 2s^2 2p^4$	16^n	2^n
${}_{11}\text{Na}$	$1s^2 2s^2 2p^6 3s^1$	1^n	3^n
${}_{15}\text{P}$	$1s^2 2s^2 2p^6 3s^2 3p^3$	15^n	3^n



B2. α) λάθος . Και από τις απώσεις μεταξύ των ηλεκτρονίων

$$n_{\text{NaOH}} = 5 \cdot 10^{-2} \cdot 10^{-2} = 5 \cdot 10^{-4} \text{ mol}$$



$$n \quad ; = n = 5 \cdot 10^{-4} \text{ mol} \quad C_{\text{HA}} = \frac{n}{V} = \frac{5 \cdot 10^{-4}}{5 \cdot 10^{-2}} = 10^{-2} \text{ M}$$

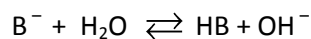
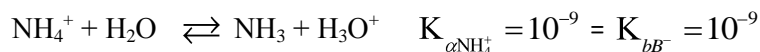
β) σωστό . $\text{HA} + \text{H}_2\text{O} \rightleftharpoons \text{A}^- + \text{H}_3\text{O}^+$

$$\text{ισορ.} \quad 10^{-2} - x \quad \quad x \quad \quad x$$

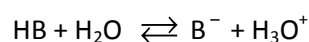
$$\text{pH} = 2 \Rightarrow [\text{H}_3\text{O}^+] = x = 10^{-2} \text{ M}$$

$C_{\text{HA}} = x = 10^{-2}$ άρα η αντίδραση μονόδρομη και το HA ισχυρό οξύ

γ) σωστό . από την διάσταση του άλατος $\text{NH}_4\text{B} \rightarrow \text{NH}_4^+ + \text{B}^-$ αφού το $\text{pH} = 7$ ιοντίζεται και το B^-



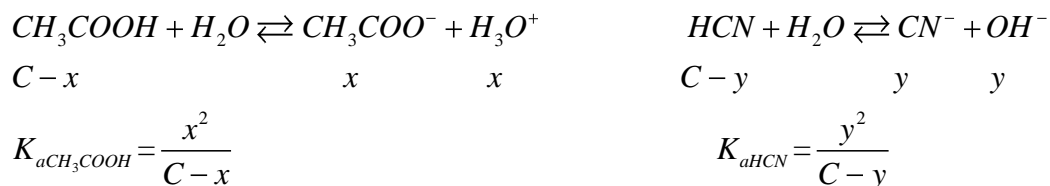
$$\text{Άρα } K_{\text{aHB}} = 10^{-5}$$



$$0,1 - x \quad \quad x \quad \quad x$$

$$K_{\text{aHB}} = 10^{-5} = \frac{x^2}{0,1 - x} \Rightarrow x^2 = 10^{-6} \Rightarrow x = [\text{H}_3\text{O}^+] = 10^{-3}, \text{pH} = 3$$

δ) λάθος .



$$[H_3O^+]_1 > [H_3O^+]_2$$

$$x > y \text{ και } C-x < C-y$$

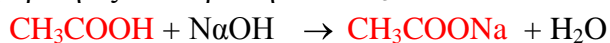
$$K_{aCH_3COOH} > K_{aHCN} \Rightarrow \frac{K_w}{K_{bCH_3COO^-}} > \frac{K_w}{K_{bCN^-}} \Rightarrow K_{bCN^-} > K_{bCH_3COO^-}$$

άρα CN^- ισχυρότερη βάση από την CH_3COO^-

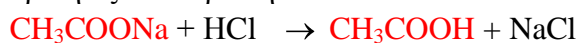
B3. α) (i) $\Delta 1 < \Delta 4 < \Delta 5 < \Delta 2$

(ii) Ανάμειξη των 1. $\Delta 3 - \Delta 4$

2. $\Delta 2 - \Delta 4$ μερική εξουδετέρωση του CH_3COOH από $NaOH$



3. $\Delta 1 - \Delta 3$ μερική εξουδετέρωση $\Delta 1 - \Delta 3$

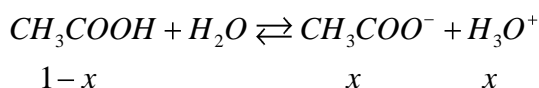


β) θεωρία

ΘΕΜΑ Γ

$$C = \frac{n}{V} = \frac{m}{V} = \frac{6}{0,1} \Rightarrow C = 1M$$

Γ1.

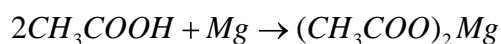


$$1-x \qquad \qquad \qquad x \qquad \qquad \qquad x$$

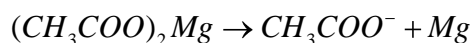
$$Ka = 10^{-5} = \frac{x^2}{C-x} \Rightarrow x^2 = 10^{-5} \Rightarrow x = 10^{-2,5} \text{ και } pH = 2,5$$

Γ2.

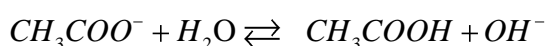
$$n = \frac{m}{Mr} = \frac{4,8}{24} = 0,2 \text{ mol Mg}$$



$$\begin{array}{ccc} 0,4 & 0,2 & - \\ -0,4 & -0,2 & 0,2 \\ 0 & 0 & 0,2 \end{array} \quad C = \frac{n}{V} = \frac{0,2}{0,4} = 0,5M$$



$$0,5 \quad ; = 1 \quad ; = 1$$



$$1-y \quad \quad \quad y \quad \quad y$$

$$K_b = 10^{-9} = \frac{y^2}{1-y} \Rightarrow y^2 = 10^{-9} \Rightarrow y = 10^{-4,5} \quad pOH = 4,5 \quad \text{και} \quad pH = 9,5$$

$$pH = pKa + \log \frac{C_{\beta\alpha}}{C_{\alpha\xi}} \Rightarrow 5 = 5 + \log \frac{C_{\beta\alpha}}{C_{\alpha\xi}} \Rightarrow C_{\beta\alpha} = C_{\alpha\xi}$$

Γ3. $CH_3COOH : C' = \frac{V_1}{V_1 + V_2} \quad \frac{V_1}{V_1 + V_2} = \frac{0,5V_2}{V_1 + V_2} \Rightarrow V_2 = 2V_1$

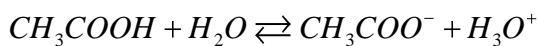
$$CH_3COONa : C' = \frac{0,5V_2}{V_1 + V_2}$$

$$\acute{\alpha}\rho\alpha \quad 1L \quad CH_3COONa \quad \text{και} \quad 0,5L \quad CH_3COOH \quad V_{\max} = 1 + 0,5 = 1,5L$$

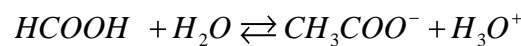
Γ4.

$$CH_3COOH : C'' = \frac{V}{2V} = 0,5M$$

$$HCOOH : C'' = \frac{CV}{2V} = \frac{C}{2}M$$



$$0,5 - \omega \quad \quad \quad \omega \quad \quad \omega + \varphi$$



$$\frac{C}{2} - \varphi \quad \quad \quad \varphi \quad \quad \omega + \varphi$$

$$K_a = 10^{-5} = \frac{\omega(\omega + \varphi)}{0,5 - \omega} = \frac{\omega \cdot 5 \cdot 10^{-3}}{0,5} \Rightarrow$$

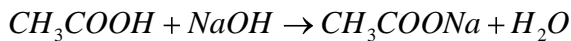
$$K_a = 2 \cdot 10^{-4} = \frac{\varphi(\omega + \varphi)}{\frac{C}{2} - \varphi} = \frac{4 \cdot 10^{-3} \cdot 5 \cdot 10^{-3}}{\frac{C}{2}} \Rightarrow$$

$$\omega = 10^{-3} \quad \text{και} \quad \varphi = 4 \cdot 10^{-3}$$

$$\Rightarrow C = 0,2M$$

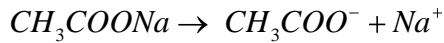
ΘΕΜΑ Δ

Δ1 .

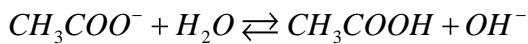


n n n

$$C_{CH_3COONa} = \frac{n}{2V} = \frac{CV}{2V} = \frac{C}{2}$$



$\frac{C}{2}$; = $\frac{C}{2}$; = $\frac{C}{2}$



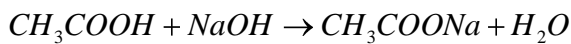
$$pH = 9, pOH = 5 \Rightarrow [OH^-] = x = 10^{-5}$$

$\frac{C}{2} - x$

x

x

$$K_{bCH_3COO^-} = \frac{x^2}{\frac{C}{2} - x} = \frac{2 \cdot 10^{-10}}{C} \quad (1)$$



n $\frac{n}{2}$ -

- $\frac{n}{2}$ - $\frac{n}{2}$ $\frac{n}{2}$

$$C_{CH_3COOH} = C_{CH_3COONa} = \frac{\frac{n}{2}}{V + \frac{V}{2}} = \frac{\frac{CV}{2}}{\frac{3V}{2}} = \frac{C}{3} M$$

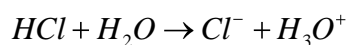
$\frac{n}{2}$ 0 $\frac{n}{2}$

$$[H_3O^+] = K_{aCH_3COOH} \cdot \frac{\cancel{C}_{\alpha\xi}}{\cancel{C}_{\beta\alpha}} \Rightarrow K_{aCH_3COOH} = 10^{-5} \quad (2)$$

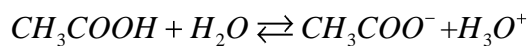
$$pH = 5 \Rightarrow [H_3O^+] = 10^{-5}$$

$$\text{Από (1) και (2)} \Rightarrow \frac{10^{-14}}{10^{-5}} = \frac{2 \cdot 10^{-10}}{C} \Rightarrow C = 0,2M$$

$$C'_{HCl} = C'_{CH_3COOH} = \frac{0,2V}{2V} = 0,1M$$



Δ2. 0,1 ; = 0,1 ; = 0,1



$$Ka = \frac{y(0,1+y)}{0,1-y} = 10^{-5} \Rightarrow y = 10^{-5}$$

0,1 - y

y

0,1+y

$$a = \frac{y}{C} = \frac{10^{-5}}{0,1} = 10^{-4}$$

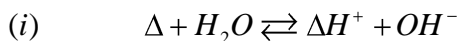
$$n_{HCl} = n_{CH_3COOH} = 0,1 \text{ mol}$$



	0,1	0,15	-	0,1	0,05	-
Δ3.	-0,1	-0,1	0,1	-0,05	-0,05	0,05
	0	0,05	0,1	0,05	0	0,05

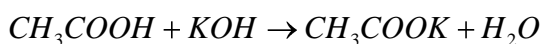
$$C_{NaCl} = C_{CH_3COOH} = C_{CH_3COONa} = \frac{0,05}{1} = 0,05M \quad , \quad pH = pKa + \log \frac{0,05}{0,05} \Rightarrow pH = 5$$

Δ4.



$$\frac{K_{b\Delta}}{[OH^-]} = \frac{[\Delta]}{[\Delta H^+]} = 10^2 \Rightarrow [OH^-] = \frac{K_{b\Delta}}{10^2} = \frac{10^{-7}}{10^2} = 10^{-9} \text{ και } [H_3O^+] = 10^{-5} M \text{ και } pH = 5$$

$$n_{CH_3COOH} = 0,2 \cdot 5 \cdot 10^{-2} = 0,01 \text{ mol}$$



0,01	n	
-n	-n	n
0,01-n	0	n

• Αν $n_{KOH} = 0,01 \text{ mol}$ τότε πλήρη εξουδετέρωση

τελ. διάλυμα $CH_3COOK \rightarrow CH_3COO^- + K^+$

$CH_3COO^- + H_2O \rightleftharpoons CH_3COOH + OH^-$ $pH > 7$ απορ.

• Αν $n_{KOH} > 0,01 \text{ mol}$ τότε τελ. διάλυμα $CH_3COOK - KOH$
 $pH > 7$ απορ.

$$C_{CH_3COOH} = \frac{0,01-n}{5 \cdot 10^{-2}} \quad C_{CH_3COOK} = \frac{n}{5 \cdot 10^{-2}}$$

$$[H_3O^+] = K_{aCH_3COOH} \cdot \frac{C_{\alpha\xi}}{C_{\beta\alpha}} \Rightarrow 10^{-5} = 10^{-5} \cdot \frac{C_{\alpha\xi}}{C_{\beta\alpha}} \Rightarrow C_{\alpha\xi} = C_{\beta\alpha}$$

$$\frac{0,01-n}{5 \cdot 10^{-2}} = \frac{n}{5 \cdot 10^{-2}} \Rightarrow 2n = 0,01 \Rightarrow n = \frac{0,01}{2} = 0,005 \text{ mol}$$

(ii) κίτρινο