ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
ΗΜΕΡΗΣΙΩΝ ΚΑΙ ΕΣΠΕΡΙΝΩΝ ΓΕΝΙΚΩΝ ΛΥΚΕΙΩΝ
ΔΕΥΤΕΡΑ 8 ΙΟΥΝΙΟΥ 2026

ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ
(Ενδεικτικές απαντήσεις)

ΘΕΜΑ Α

$A_1 \to \delta,\quad A_2 \to \beta,\quad A_3 \to \alpha,\quad A_4 \to \gamma,\quad A_5\ \ \alpha \to \Sigma, \beta \to \Sigma, \gamma \to \Lambda, \delta \to \Lambda, \epsilon \to \Sigma$

ΘΕΜΑ Β

$B_1 \to$ (iii)

για περίοδο $T_1 \to$ είναι δυο δεσμοί άρα $N_1 + 1 = 2 \Rightarrow N_1 = 1$ άρα $L = \frac{\lambda_1}{4} + 1 \cdot \frac{\lambda_1}{2} \Rightarrow L = \frac{3\lambda_1}{4}$ (1)

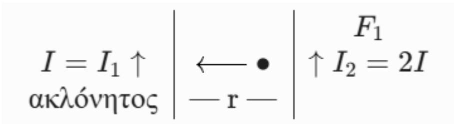
για περίοδο $T_2 \to$ είναι 3 δεσμοί άρα $N_2 + 1 = 3 \Rightarrow N_2 = 2$ άρα $L = \frac{\lambda_2}{4} + 2 \cdot \frac{\lambda_2}{2} \Rightarrow L = \frac{5\lambda_2}{4}$ (2)

από (1) και (2) $\Rightarrow 3\frac{\lambda_1}{4} = 5\frac{\lambda_2}{4} \Rightarrow 3 \cdot \upsilon \cdot T_1 = 5 \cdot \upsilon \cdot T_2 \Rightarrow \boxed{\frac{T_1}{T_2} = \frac{5}{3}}$

$B_2 \to$ (i)

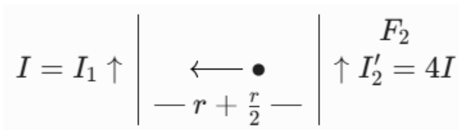
όταν η απόσταση μεταξύ τους είναι r :

$F_1 = \frac{\mu_0}{4\pi} \cdot \frac{2I_1}{r} \cdot I_2 \cdot \ell = \frac{\mu_0}{\cancel{4}\pi} \cdot \frac{\cancel{2}I}{r} \cdot \cancel{2}I \cdot \ell$ (1)



όταν η απόσταση μεταξύ τους γίνει $\frac{3r}{2}$:

$F_2 = \frac{\mu_0}{4\pi} \cdot \frac{2I_1}{\frac{3r}{2}} \cdot I_2' \cdot \ell = \frac{\mu_0}{\cancel{4}\pi} \cdot \frac{2I}{\frac{3r}{2}} \cdot \cancel{4}I \cdot \ell$ (2)



από $\frac{(1)}{(2)} \Rightarrow \frac{F_1}{F_2} = \frac{1}{\frac{4}{3}} \Rightarrow \boxed{\frac{F_1}{F_2} = \frac{3}{4}}$

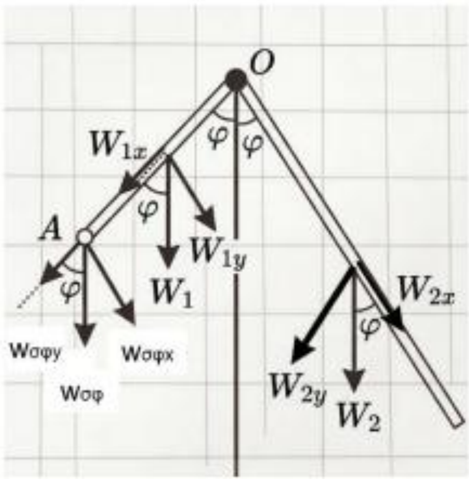
ΖΒ3 → ii

Το σύστημα ισορροπεί:

$\sum \vec{\tau}_{(O)} = 0 \Rightarrow W_{1y} \cdot \ell_1 + W_y \cdot \frac{\ell_1}{2} - W_y \cdot \frac{\ell_2}{2} = 0$

$\Rightarrow \frac{m}{2} \cdot g \cdot \eta\mu\varphi \cdot \ell_1 + m \cdot g \cdot \eta\mu\varphi \cdot \frac{\ell_1}{2} = m \cdot g \cdot \eta\mu\varphi \cdot \frac{\ell_2}{2} \overset{\times 2}{\Rightarrow}$

$\Rightarrow \ell_1 + \ell_1 = \ell_2 \Rightarrow 2\ell_1 = \ell_2 \Rightarrow \boxed{\frac{\ell_1}{\ell_2} = \frac{1}{2}}$



ΘΕΜΑ Γ

Γ1. $\lambda = 8\lambda_c$

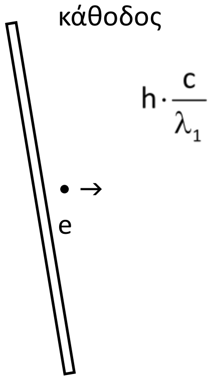
$\lambda' - \lambda = \frac{h}{m_e c}(1 - \sigma\upsilon\nu\varphi) \Rightarrow \lambda' = 8\lambda_c + \lambda_c \cdot 2 \Rightarrow \boxed{\lambda' = 10\lambda_c}$

Γ2.

- $E_\varphi = h \cdot \frac{c}{\lambda} \Rightarrow E_\varphi = h \cdot \frac{c}{8\lambda_c} \Rightarrow E_\varphi = \frac{h \cdot c}{8 \cdot \frac{h}{m_e c}} \Rightarrow \boxed{E_\varphi = \frac{m_e c^2}{8}}$

- $E_{\varphi'} = h \cdot \dfrac{c}{\lambda'} \Rightarrow E_{\varphi'} = h \cdot \dfrac{c}{10\lambda_c} \Rightarrow E_{\varphi'} = h \cdot \dfrac{c}{10 \cdot \dfrac{h}{m_e c}} \Rightarrow \boxed{E_{\varphi'} = \dfrac{m_e c^2}{10}}$
- $E_{\varphi} = E_{\varphi'} + K_e \Rightarrow K_e = \dfrac{m_e c^2}{8} - \dfrac{m_e c^2}{10} \Rightarrow K_e = \dfrac{2m_e c^2}{80} \Rightarrow K_e = \dfrac{m_e c^2}{40} = \dfrac{5 \cdot 10^5 eV}{40} \Rightarrow \boxed{K_e = 1{,}25 \cdot 10^4 eV}$

Γ3.



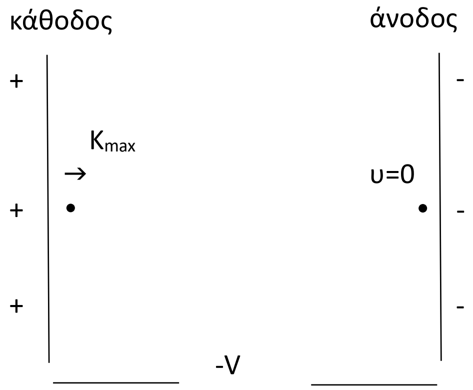
Από εξίσωση Einstein: $E_{\phi} = K_{max} + \Phi \Rightarrow$

αν $K_{max} = 0$ τότε $E_{\phi} = \Phi \Rightarrow$

$h \cdot f_0 = \Phi \Rightarrow f_0 = \dfrac{\Phi}{h} \Rightarrow f_0 = \dfrac{1{,}4 \cdot 1{,}6 \cdot 10^{-19} J}{6{,}4 \cdot 10^{-34} J \cdot s} \Rightarrow$

$\Rightarrow f_0 = \dfrac{1{,}4}{4} \cdot 10^{15} \Rightarrow \boxed{f_0 = \dfrac{7}{2} \cdot 10^{14} Hz}$

Γ4.



ΘΜΚΕ από κάθοδο→ άνοδο

$W_{o\lambda} = \Delta K \Rightarrow -V_0 \cdot |e| = 0 - K_{max} \Rightarrow$

$V_0 = \dfrac{K_{max}}{|e|} \Rightarrow V_0 = \dfrac{h \cdot \dfrac{c}{\lambda_1} - \Phi}{e} \Rightarrow$

$$\Rightarrow V_0 = \frac{\frac{1200 \cdot \cancel{1,6 \cdot 10^{-19}} \cdot 10^{-9}}{400 \cdot 10^{-9}} - 1,4 \cdot \cancel{1,6 \cdot 10^{-19}}}{\cancel{1,6 \cdot 10^{-19}}} \Rightarrow V_0 = \frac{3-1,4}{1} \Rightarrow \boxed{V_0 = 1,6\text{Volt}}$$

ΘΕΜΑ Δ

Δ1.

- Ο ΚΛ ισορροπεί: $\sum \vec{F}_y = 0 \overset{\uparrow +}{\Rightarrow} F - T - W_2 = 0 \Rightarrow$

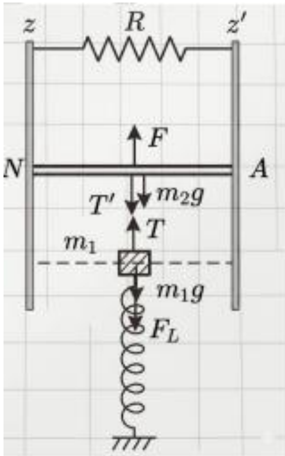
  $T = F - W_2 \Rightarrow T = 3 - 1 \Rightarrow \boxed{T = 2N}$
- το Σ στη θέση που ισορροπεί με το νήμα:

  $\sum \vec{F}_y = 0 \overset{\uparrow +}{\Rightarrow} T' - F_{\varepsilon\lambda} - W_1 = 0 \Rightarrow F_{\varepsilon\lambda} = T' - W_1 \Rightarrow$

  $\Rightarrow K \cdot \Delta\ell = T' - m_1 \cdot g \Rightarrow \Delta\ell = \frac{2-1}{10} \Rightarrow \boxed{\Delta\ell = 0,1m}$
- Το Σ στη ΘΙ της ταλάντωσης:

  $\Sigma \vec{F}_y = 0 \overset{\uparrow +}{\Rightarrow} F_{\varepsilon\lambda'} - W_1 = 0 \Rightarrow K \cdot \Delta\ell_0 = m_1 \cdot g \Rightarrow \boxed{\Delta\ell_0 = \frac{1}{10} = 0,1m}$

  άρα $A = \Delta\ell_0 + \Delta\ell \Rightarrow \boxed{A = 0,2m}$



την $t = 0 : x = +A \ldots$ $\boxed{\varphi_0 = \frac{\pi}{2}\text{rad}}$

- $\omega = \sqrt{\frac{K}{m_1}} \Rightarrow \omega = \sqrt{\frac{10}{0,1}} \Rightarrow \omega = 10\text{rad/s}$
- $\boxed{x = 0,2 \cdot \eta\mu\left(10t + \frac{\pi}{2}\right)}$ S.I.

Σε τυχαία θέση ισχύει:

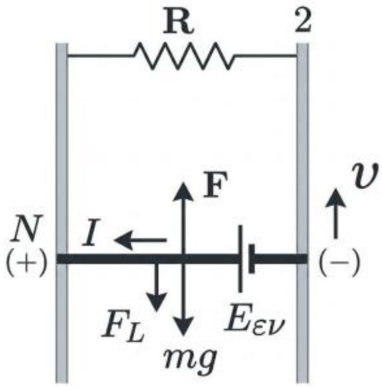
$\frac{K}{E_{\tau\alpha\lambda}} = \frac{3}{4} \Rightarrow K = \frac{3}{4} E_{\tau\alpha\lambda}$, από ΑΔΕΤ: $E_{\tau\alpha\lambda,\alpha\rho\chi} = E_{\tau\alpha\lambda,\tau\varepsilon\lambda} \Rightarrow E_{\tau\alpha\lambda} = K + U_{\tau\alpha\lambda} \Rightarrow$

$\Rightarrow E_{\tau\alpha\lambda} = \frac{3}{4} E_{\tau\alpha\lambda} + U_{\tau\alpha\lambda} \Rightarrow \frac{1}{4} E_{\tau\alpha\lambda} = U_{\tau\alpha\lambda} \Rightarrow \frac{1}{4} \cdot \cancel{\frac{1}{2}} K A^2 = \cancel{\frac{1}{2}} K \cdot x^2 \Rightarrow x = \pm \frac{A}{2}$ άρα $|x| = \frac{A}{2}$ (1)

- η επιτάχυνση: $\alpha = -\omega^2 \cdot x$ άρα $|\alpha| = \omega^2 \cdot \frac{A}{2} \Rightarrow |\alpha| = 100 \cdot \frac{0,2}{2} \Rightarrow \boxed{|\alpha| = 10\frac{m}{s^2}}$

Δ3.

Η $E_{\varepsilon\pi} = B \cdot u \cdot \ell \rightarrow I_{\varepsilon\pi} = \frac{Bu\ell}{R_{O\Lambda}} \Rightarrow I_{\varepsilon\pi} = \frac{1 \cdot u \cdot 1}{2} \Rightarrow I_{\varepsilon\pi} = \frac{u}{2}$ (1)



- $\Sigma\vec{F} \uparrow\uparrow \vec{\alpha}$: επιταχύνεται
- $\Sigma \vec{F}_y = m \cdot \vec{\alpha} \overset{\uparrow +}{\Rightarrow} F - F_L - W_1 = m \cdot \alpha \Rightarrow \alpha = \frac{3 - 1 - B \cdot I_{\varepsilon\pi} \cdot \ell}{0,1} \Rightarrow$

  $\Rightarrow \alpha = \frac{2 - 0,5 \cdot u}{0,1} \Rightarrow \boxed{\alpha = 20 - 5 \cdot u}$ αφού $u \uparrow$ τότε $\alpha \downarrow$ άρα επιταχύνεται με φθίνοντα ρυθμό
- αν α = 0 τότε $u = u_{o\rho} : 5 \cdot u_{o\rho} = 20 \Rightarrow \boxed{u_{o\rho} = 4\frac{m}{s}}$

Δ4.

- Στο χρονικό διάστημα $\Delta t = 0{,}125s$ έχει μετατοπιστεί κατά $\Delta x = u_{ορ} \cdot \Delta t \Rightarrow$
  $\Rightarrow \Delta x = 4 \cdot 0{,}125 \Rightarrow \boxed{\Delta x = 0{,}5m}$
- $E_{επ} = B \cdot u_{ορ} \cdot \ell \Rightarrow E_{επ} = 4Volt$ άρα $I_{επ} = \dfrac{E_{επ}}{R_{ΟΛ}} \Rightarrow I_{επ} = \dfrac{4}{2} = 2A$
- $Q_{(R)} = I_{επ}^2 \cdot R_{ολ} \cdot \Delta t \Rightarrow Q_{(R)} = 2^2 \cdot 2 \cdot 0{,}125 \Rightarrow \boxed{Q_{(R)} = 1J}$ ή $|W_{F_L}| = F_L \cdot \Delta x = \ldots$
- $W_F = F \cdot \Delta x \Rightarrow W_F = 3 \cdot 0{,}5 \Rightarrow \boxed{W_F = 1{,}5J}$
- $\Pi = \dfrac{Q_{(R)}}{W_F} \cdot 100 \Rightarrow \Pi = \dfrac{1}{1{,}5} \cdot 100 \Rightarrow \Pi = \dfrac{10}{15} \cdot 100 = \dfrac{2}{3} \cdot 100 = \boxed{\dfrac{200}{3}\%}$