ΘΕΜΑΤΑ ΠΡΟΣΟΜΟΙΩΣΗΣ
ΠΑΝΕΛΛΑΔΙΚΩΝ ΕΞΕΤΑΣΕΩΝ
ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ 2025
ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ

ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α

Α1. β, Α2. α, Α3. δ , Α4. α, Α5. Λ,Λ,Λ,Λ,Σ

ΘΕΜΑ Β

Β1.

Α. σελ. 208 Β΄ τεύχος σχολικό (α)

Β. $I_{max} = \frac{E}{R_{ολ}} = \frac{E}{2R}$

2ος kirchhoff

$E - |E_{αυτ}| - i \cdot r - i \cdot R = 0 \xRightarrow{i = \frac{I_{max}}{4}}$

$E - |E_{αυτ}| - \frac{E}{8R} \cdot 2R = 0 \Rightarrow |E_{αυτ}| = \frac{3E}{4} \Rightarrow \boxed{\frac{di}{dt} = \frac{3E}{4L}}$ (γ)

Β2.

$E = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{E}$

Έχουμε: $\lambda' - \lambda = \frac{h}{mc}(1-συνφ) \Rightarrow \frac{hc}{E} - \frac{hc}{E'} = \frac{h}{mc}(1-συνφ)$

$\Rightarrow \boxed{E' = \frac{Emc^2}{mc^2 + E(1-συνφ)}}$

Όμως $K = E - E' = E - \frac{Emc^2}{mc^2 + E(1-συνφ)} \Rightarrow$

$\boxed{K = \frac{E^2(1-συνφ)}{mc^2 + E(1-συνφ)}}$ (α)

B3.

$$\left.\begin{array}{l} r_1 = 2\sqrt{\frac{a^2}{4}+d_1^2} \\ r_2 = 2\sqrt{\frac{a^2}{4}+d_2^2} \end{array}\right| \Longrightarrow \quad r_2 - r_1 = k\lambda + \frac{\lambda}{2} \Rightarrow$$

$$\boxed{2\sqrt{\frac{a^2}{4}+d_2^2} - 2\sqrt{\frac{a^2}{4}+d_1^2} = k\lambda + \frac{\lambda}{2}} \quad (1)$$

για $a' = 3a$, $d_1' = 3d_1$ κ' $d_2' = 3d_2$

$$r_2' - r_1' = 2\sqrt{\frac{3^2a^2}{4}+3^2d_2^2} - 2\sqrt{\frac{3^2a^2}{4}+3^2d_1^2} = 3\left(2\sqrt{\frac{a^2}{4}+d_2^2} - 2\sqrt{\frac{a^2}{4}+d_1^2}\right)$$

$$\overset{(1)}{=} 3(k\lambda + \lambda/2) = 3k\lambda + \lambda + \frac{\lambda}{2} = 3(k+1)\lambda + \frac{\lambda}{2} = 3N + \frac{\lambda}{2}$$

άρα $\boxed{A' = 0}$ (β)

ΘΕΜΑ Γ

Γ1.

$f_0 = 3 \cdot 10^{15}\ Hz$

$\varphi = hf_0 = 19{,}8 \cdot 10^{-19}\ J$

ή $\varphi = 12{,}375\ eV$

$c = \lambda \cdot f$

$\lambda = 10^{-7} m$

• ορατό $4 \cdot 10^{-7} m$ έως $7 \cdot 10^{-7} m$

άρα δεν ανήκει στο ορατό.

Γ2.

$K_{max} = hf' - \varphi$

$K_{max} = 19{,}8 \cdot 10^{-19}\ J$

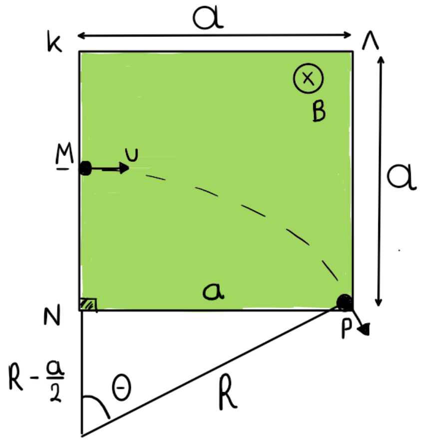
$|V_0| = \frac{K_{max}}{e}$

$V_0 = -12{,}375\ V$

ΘΜΚΕ

$K_{αν} - K_{max} = eV \Rightarrow \upsilon_{αν} = 3 \cdot 10^6\ m/s$

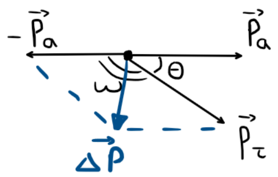
Γ3.



- $R^2 = a^2 + \left(R - \frac{a}{2}\right)^2 \Rightarrow R = \frac{5a}{4}$

  $\eta\mu\theta = \frac{a}{R} = \frac{4}{5}$, $\sigma\upsilon\nu\theta = \frac{3}{5}$

- $\left(R = \frac{mv}{Bq} \Rightarrow B = \frac{27}{8} \cdot 10^{-5}\,T\right)$



$\Delta\vec{P} = \vec{P}_\tau - \vec{P}_a$

$\Delta\vec{P} = \vec{P}_\tau + (-\vec{P}_a)$

$\Delta K = 0$

αφού $W_{F_{Lor}} = 0$

$\Delta P^2 = P_a^2 + P_\tau^2 + 2P_aP_\tau\sigma\upsilon\nu\omega \xRightarrow{P_\tau = P_a = P}$

$\Delta P = \frac{2\sqrt{5}}{5}P = \frac{54\sqrt{5}}{5} \cdot 10^{-25}\,kgm/s$

Γ4.

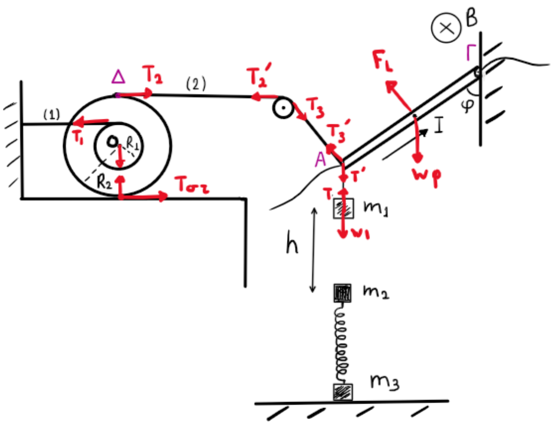
$i = \frac{q}{t} \Rightarrow q = i \cdot t \Rightarrow q = 3{,}2 \cdot 10^{-3}\,C$

- $N_e = \frac{q}{e} = 2 \cdot 10^{16}$ άρα $N_\varphi = 2 \cdot 10^{16}$

- $P = \frac{E_\varphi}{t} = \frac{N_\varphi \cdot h \cdot f}{t} = 79{,}2 \cdot 10^{-3}\,W$

ΘΕΜΑ Δ

Δ1.



m_1

$\Sigma F_1 = 0$

$T = w_1$

$T = 20N$

M

$\Sigma \tau^{(\Gamma)} = 0$

$-F_L \cdot \frac{\ell}{2} - T_3 \cdot \ell + w_\varphi \frac{\ell}{2}\eta\mu\varphi + T'\ell\eta\mu\varphi = 0$

$T_3 = 15N$ όπου $F_L = BI\ell$

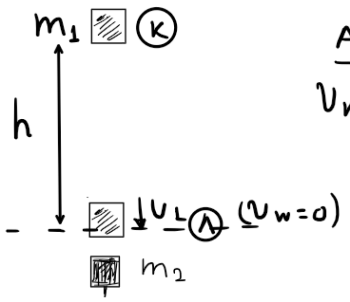
Δίσκος

$\Sigma \tau^{(0)} = 0$

$T_{\sigma\tau}(R_1 + R_2) = T_2(R_2 - R_1)$

$T_{\sigma\tau} = 5N$

Δ2.



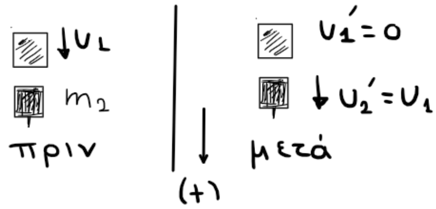
ΑΔΜΕ Κ→Λ

$U_K + K_K = U_\Lambda + K_\Lambda$

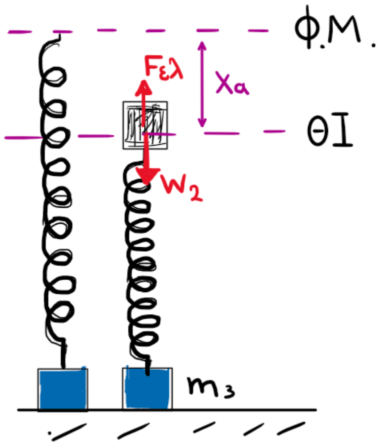
$m_1 \cdot g h = \frac{1}{2} m_1 \upsilon_1^2$

$\upsilon_1 = \sqrt{2gh}$

$\upsilon_1 = 4\,m/s$



κεντρική ελαστική με $m_1 = m_2$ → ανταλλαγή ταχυτήτων



Θ.Ι

$\Sigma F = 0$

$F_{\varepsilon\lambda} = W_2$

$x_a = 0{,}4m$

ΑΔΕΤ

$\frac{1}{2} D A^2 = \frac{1}{2} D \cdot x^2 + \frac{1}{2} m_2 \upsilon_2'^2 \xrightarrow{x=0}$

$\Rightarrow A = 0{,}8m$

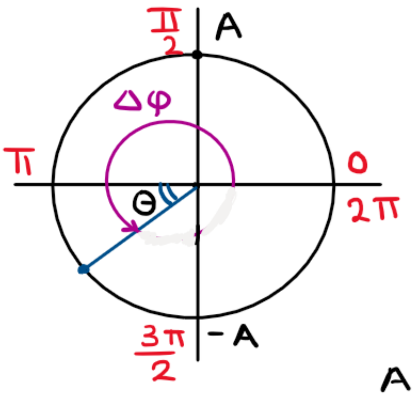
$\omega = \sqrt{\frac{D}{m_2}}$

$\omega = 5\,\frac{rad}{s}$

για $t=0 \rightarrow x=0$ κ' $\upsilon>0 \Rightarrow \varphi_0 = 0$

άρα $x = 0{,}8\,\eta\mu(5t)$ SI

Δ3.



ΦΜ → $x = -\frac{A}{2}$

$\eta\mu\theta = \frac{A/2}{A} = \frac{1}{2}$

$\theta = \frac{\pi}{6}$

άρα $\Delta\varphi = \frac{7\pi}{6}$ rad

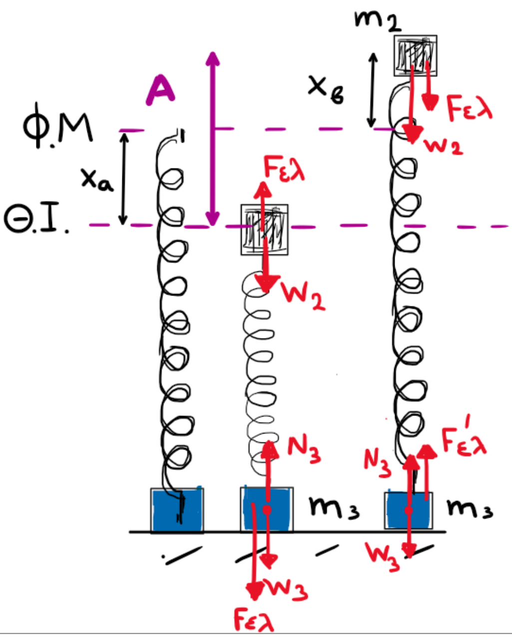
$\omega = \frac{\Delta\varphi}{\Delta t} \Rightarrow$

$\Rightarrow \Delta t = \frac{7\pi}{30}$ s

ΑΔΕΤ για το ΦΜ → $\upsilon_{\Phi M} = -2\sqrt{3}\,m/s$

$\frac{dK}{dt} = -D \cdot x \cdot \upsilon = -40\sqrt{3}\,m/s$

Δ4.

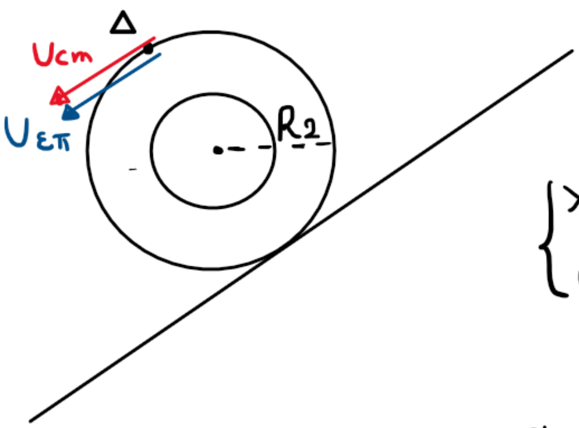


Για να χαθεί η επαφή πρέπει το m_2 να είναι πάνω από το Φ.Μ

$$F'_{ελ} = W_3 \Rightarrow k\cdot x_β = m_3\cdot g \xrightarrow{x_β = A - x_0}$$

$$\Rightarrow \boxed{m_3 = 2kg}$$

Δ5.



$υ_Δ = 2υ_{cm}$

$20 = 2υ_{cm}$

$υ_{cm} = 10 m/s$

$x_{cm} = θ\cdot R_2$

$x_{cm} = 4 m$

$$\begin{cases} x_{cm} = \frac{1}{2} a_{cm}\cdot t^2 \\ υ_{cm} = a_{cm}\, t \end{cases} \xRightarrow{\div} \frac{2x_{cm}}{υ_{cm}} = t$$

$\Rightarrow t = 0,8s$ κ' $a_{cm} = 12,5 m/s^2$

$$a_{γων} = \frac{a_{cm}}{R_2} \Rightarrow a_{γων} = 12,5π \ rad/s^2$$

Επιμέλεια: Ραγκούσης Λεωνίδας, Φυσικός