ΘΕΜΑΤΑ ΦΥΣΙΚΗΣ 2026

ΘΕΜΑ Α

Α1 δ

Α2 β

Α3 α

Α4 γ

Α5 α Σ

β Σ

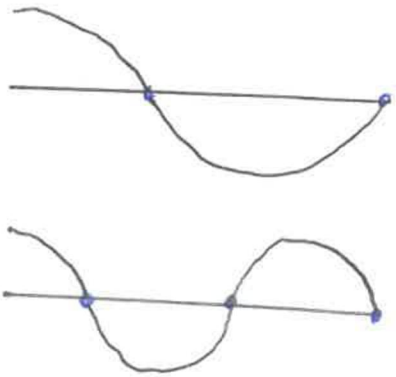
γ Λ

δ Λ

ε Σ

ΘΕΜΑ Β

Β1 (iii)



Αρχικά $L = \frac{3}{4}\lambda_1$

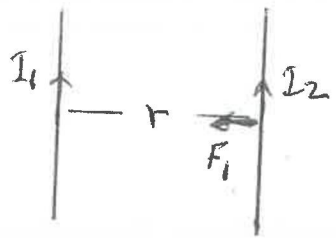
Τελικά $L = \frac{5}{4}\lambda_2$ $\Big| \Rightarrow$

$$\frac{3}{4}\lambda_1 = \frac{5}{4}\lambda_2 \Rightarrow 3\not{\nu}T_1 = 5\not{\nu}T_2 \Rightarrow \frac{T_1}{T_2} = \frac{5}{3}$$

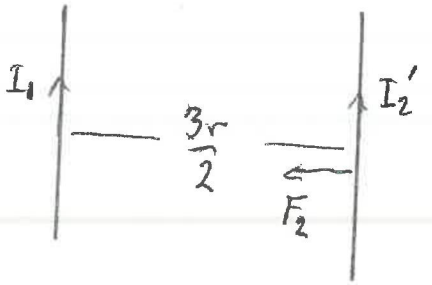
Β2 (i)

Αρχικά $F_1 = \frac{\mu_0}{4\pi}\frac{2I_1I_2}{r}\ell$

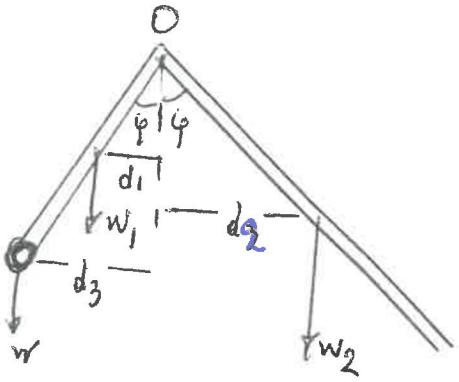
Τελικά $F_2 = \frac{\mu_0}{4\pi}\frac{2I_1I_2'}{\frac{3r}{2}}\ell$ $\Big\} \overset{(:)}{\Rightarrow}$



$$\frac{F_1}{F_2} = \frac{I_2\,3}{I_2'\,2} = \frac{3I_2}{2I_2\cdot 2} = \frac{3}{4}$$



B_3 (ii)



$\Sigma \tau_O = 0 \Rightarrow$

$w_1 d_1 + w d_3 - w_2 d_2 = 0 \rightarrow$

$M_g \frac{l_1}{2} \eta\mu\varphi + \frac{M}{2} g \, l \, \eta\mu\varphi = M g \frac{l_2}{2} \eta\mu\varphi \Rightarrow$

$\frac{l_1}{2} \eta\mu\varphi + \frac{l_1}{2} \eta\mu\varphi = \frac{l_2}{2} \eta\mu\varphi \Rightarrow \frac{2 l_1}{2} = \frac{l_2}{2} \rightarrow \frac{l_1}{l_2} = \frac{1}{2}$

ΘΕΜΑ Γ

Γ1. $\lambda' = \lambda + \frac{h}{mc}(1 - \sigma\upsilon\varphi) \Rightarrow \lambda' = 8\lambda_c + \lambda_c(1 - (-1))$

$\Rightarrow \lambda' = 8\lambda_c + 2\lambda_c \rightarrow \lambda' = 10\lambda_c$

$\lambda_c = \frac{h}{mc} = \frac{hc}{mc^2} = \frac{1200 \text{ eV nm}}{5 \cdot 10^5 \text{ eV}} = 240 \cdot 10^{-5} \text{ nm}$

$\Rightarrow \lambda_c = 24 \cdot 10^{-13} \text{ m}$

άρα $\lambda' = 10\lambda_c = 24 \cdot 10^{-12} \text{ m}$

Γ2.

$E_\varphi = hf = h\frac{c}{\lambda} = \frac{hc}{8\lambda_c} = \frac{hc}{8\frac{h}{mc}} = \frac{1}{8}mc^2$

$E'_\varphi = hf' = h\frac{c}{\lambda'} = \frac{hc}{10\lambda_c} = \frac{hc}{10\frac{h}{mc}} = \frac{1}{10}mc^2$

$K_e = E_\varphi - E'_\varphi = \left(\frac{1}{8} - \frac{1}{10}\right)mc^2 = \frac{1}{40}mc^2 \Rightarrow$

$K_e = \frac{1}{40} \cdot 5 \cdot 10^5 \text{ eV} \Rightarrow K_e = 12500 \text{ eV}$

Γ3. Ισχύει $K = E_\varphi - \varphi \Rightarrow K = hf - \varphi$

Πρέπει $K \geq 0 \rightarrow hf - \varphi \geq 0 \Longrightarrow hf \geq \varphi \Rightarrow$

$f \geq \frac{\varphi}{h} \Rightarrow f \geq f_0$

Είναι $f_0 = \frac{\varphi}{h} = \frac{1,4 \cdot 1,6 \cdot 10^{-19}}{6,4 \cdot 10^{-34}} \Rightarrow f_0 = 3,5 \cdot 10^{14}\ Hz$

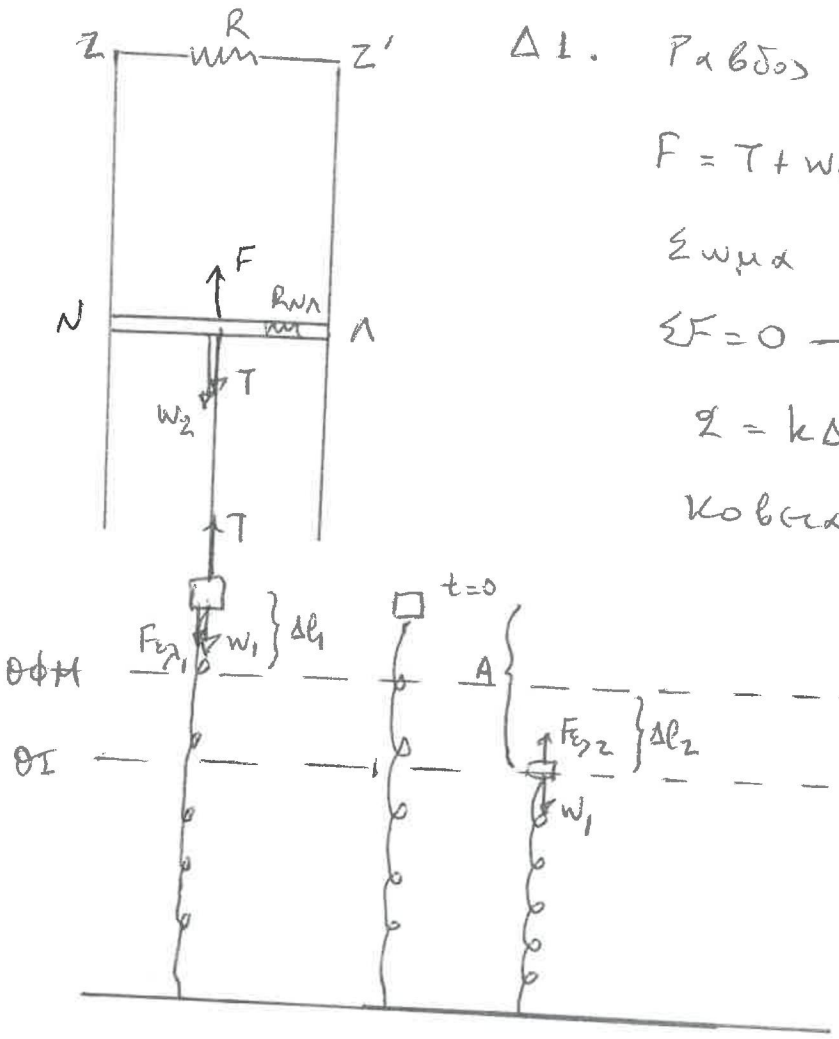
Γ4. $E_\varphi = hf_1 = h\frac{c}{\lambda_1} = \frac{1200\ eV \cdot nm}{400\ nm} = 3\ eV$

$K = E_\varphi - \varphi \rightarrow K = 3 - 1,4 \Rightarrow K = 1,6\ eV$

$\Theta\varepsilon\varepsilon_{K \rightarrow A} \Rightarrow \Delta K = \Sigma W \Rightarrow K_A - K_K = q V_{KA} \Rightarrow$

$0 - K = -|e| V_{KA} \Rightarrow V_{KA} = \frac{K}{|e|} = \frac{1,6\ eV}{|e|} = 1,6\ V$

ΘΕΜΑ Δ



Δ1. Ράβδος ισορροπεί άρα $ΣF=0$

$F = T + w_2 \Rightarrow 3 = T + 1 \Rightarrow T = 2N$

Σώμα m_1 ισορροπεί άρα

$ΣF=0 \rightarrow T = F_{ελ1} + w_1 \Rightarrow$

$2 = kΔl_1 + 1 \rightarrow 10Δl_1 = 1 \Rightarrow Δl_1 = 0,1m$

Κόβεται το νήμα

Στη ΘΙ $ΣF=0$

$F_{ελ2} = w_1 \Rightarrow$

$kΔl_2 = m_1 g \rightarrow$

$Δl_2 = \frac{m_1 g}{k} \rightarrow$

$Δl_2 = \frac{1}{10} = 0,1m$

Είναι $A = Δl_1 + Δl_2 \rightarrow A = 0,2m$

$D = k \Rightarrow m_1 ω^2 = k \Rightarrow ω = \sqrt{\frac{k}{m_1}} = 10 rad/s$

$x = A ημ(ωt + φ_0) \xrightarrow[x=A]{t=0} A = A ημφ_0 \Rightarrow ημφ_0 = 1 \rightarrow φ_0 = \frac{π}{2}$

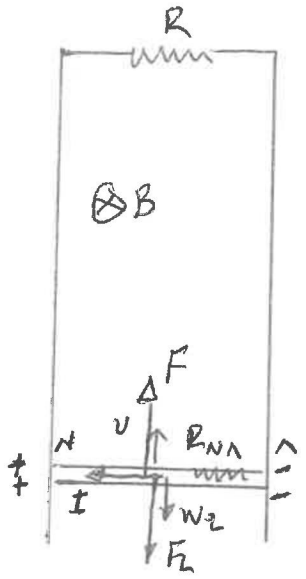
Άρα $x = 0,2 ημ(10t + \frac{π}{2})$ (SI)

Δ2. Είναι $K = \frac{3}{4}E$ άρα $U = \frac{1}{4}E \Rightarrow$

$\frac{1}{2}kx^2 = \frac{1}{4}\frac{1}{2}kA^2 \Rightarrow x^2 = \frac{A^2}{4} \Rightarrow |x| = \frac{A}{2} = 0,1m$

$ΣF = ma \rightarrow -kx = mα \Rightarrow |α| = \frac{k}{m}|x| \Rightarrow$

$|α| = ω^2|x| = 100 \cdot 0,1 \Rightarrow |α| = 10 m/s^2$



Δ3. Είναι $\mathcal{E}_{επ} = Bυl$

$$I = \frac{\mathcal{E}_{επ}}{R_{ολ}} = \frac{Bυl}{R+R_{ΝΑ}} \quad (1)$$

$$\Sigma F = m_2 a \rightarrow F - F_L - w_2 = m_2 a \Rightarrow$$

$$a = \frac{F - BIl - m_2 a}{m} \quad (2)$$

Όσο $t \uparrow \xrightarrow[\vec{a} \uparrow\uparrow \vec{υ}]{υπάρχει} υ \uparrow \overset{(1)}{\Rightarrow} I \uparrow \overset{(2)}{\Rightarrow} a \downarrow$

Δηλ. κινείται επιταχυνόμενη με επιτάχυνση που το μέτρο της μειώνεται

Όταν όταν $\Sigma F = 0 \Rightarrow F = w_2 + F_L \rightarrow$

$$F - m_2 g = BIl \overset{(1)}{\Rightarrow} F - m_2 g = B\frac{Bυ_{op}l}{R+R_{ΝΑ}} l \rightarrow$$

$$υ_{op} = \frac{(F - m_2 g)(R+R_{ΝΑ})}{B^2 l^2} = \frac{(3-1)(1+1)}{1} \Rightarrow υ_{op} = 4\,m/s$$

Δ4. Είναι $h = υ_{op} Δt = 4 \cdot \frac{1}{8} = 0{,}5\,m$

$$W_F = F \cdot h = 3 \cdot 0{,}5 = 1{,}5\,J$$

$$(1) \Rightarrow I = \frac{Bυ_{op}l}{R+R_{ΝΑ}} = \frac{4}{2} = 2\,A$$

$$Q = I^2 (R+R_{ΝΑ}) \cdot Δt = 2^2 \cdot 2 \cdot \frac{1}{8} \Rightarrow Q = 1\,J$$

$$Π = \frac{Q}{W_F} \cdot 100\% = \frac{1}{1{,}5} \cdot 100\% \Rightarrow Π = \frac{200}{3}\,\%$$