ΦΥΣΙΚΗ - ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ

ΠΡΟΤΕΙΝΟΜΕΝΕΣ ΛΥΣΕΙΣ

ΘΕΜΑ Α

Α1. →δ

Α2. →β

Α3. →α

Α4. →γ

Α5. α. → Σωστό

β.→ Σωστό

γ. →Λαθος

δ. →Λάθος

ε.→Σωστό

ΘΕΜΑ Β

Β1. → iii

ΘΕΜΑ Β

Β1) $v = \lambda \cdot f \Rightarrow v = \frac{\lambda}{T} \Rightarrow \lambda = v \cdot T$

$x = (2k+1) \cdot \frac{\lambda}{4} \Rightarrow L = (2k+1) \cdot \frac{v \cdot T}{4}$

- 2 δεσμοί άρα $k = 1$

$L = (2 \cdot 1 + 1) \cdot \frac{v \cdot T_1}{4} \Rightarrow L = \frac{3 \cdot v \cdot T_1}{4}$

- 3 δεσμοί άρα $k = 2$

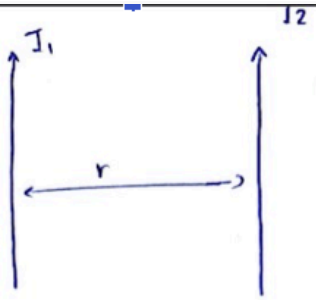
$L = (2 \cdot 2 + 1) \cdot \frac{v \cdot T_2}{4} \Rightarrow L = \frac{5 \cdot v \cdot T_2}{4}$

άρα $\frac{L}{L} = \frac{\frac{3 \cdot v \cdot T_1}{4}}{\frac{5 \cdot v \cdot T_2}{4}} \Rightarrow \boxed{\frac{T_1}{T_2} = \frac{5}{3}}$ (δ)

B2. → i

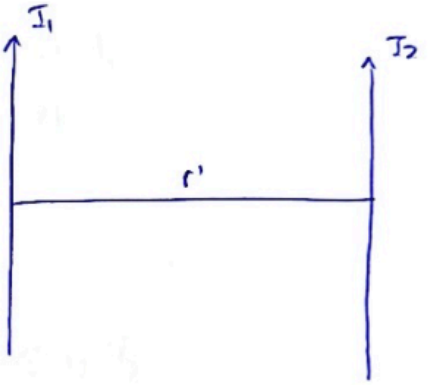
B2) $I_1 = I$

$I_2 = 2I$



$r' = d + r = \frac{r}{2} + r = \frac{3r}{2}$

$I_2' = 2I_2 = 4 \cdot I$



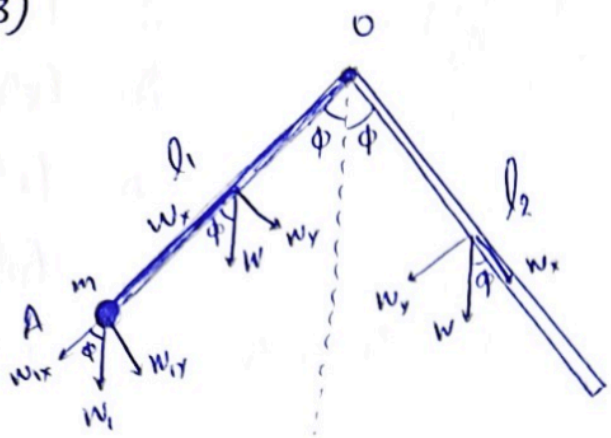
$$F_1 = \frac{\mu_0 \cdot I \cdot 2I}{2\pi r} \cdot \ell = \frac{\mu_0 I^2 \ell}{\pi \cdot r}$$

$$F_2 = \frac{\mu_0 \cdot I \cdot 4I}{2\pi \cdot r'} \ell = \frac{4\mu_0 I^2 \ell}{2\pi \cdot \frac{3r}{2}} = \frac{4\mu_0 I^2 \ell}{3\pi r}$$

Άρα $\frac{F_1}{F_2} = \frac{\frac{\mu_0 I^2 \ell}{\pi r}}{\frac{4\mu_0 I^2 \ell}{3\pi r}} \Rightarrow \boxed{\frac{F_1}{F_2} = \frac{3}{4}}$

B3. → ii

B3)



$m = \frac{M}{2}$

έχω ότι:

$w = M \cdot g$

$w_1 = mg = \frac{Mg}{2}$

$w_1 = \frac{w}{2}$

$\Sigma \tau_o = 0$

$Mg \frac{l_1}{2} \eta\mu\phi + w_1 \cdot g \cdot l_1 \cdot \eta\mu\phi - Mg \frac{l_2}{2} \eta\mu\phi = 0$

$Mg \frac{l_1}{2} \eta\mu\phi + \frac{M}{2} g \cdot l_1 \cdot \eta\mu\phi - Mg \frac{l_2}{2} \eta\mu\phi = 0$

$\frac{2l_1}{2} \eta\mu\phi + \frac{2l_1}{2} \eta\mu\phi - \frac{2}{2} l_2 \eta\mu\phi = 0 \Rightarrow \boxed{\frac{l_1}{l_2} = \frac{1}{2}}$ (ii)

ΘΕΜΑ Γ

$\lambda = 8 \cdot \lambda_c \qquad \lambda_c = \frac{h}{m_e \cdot c}$

Γι. $\lambda' - \lambda = \frac{h}{m_e c}(1 - \sigma\upsilon\nu\phi)$

$\lambda' - \lambda = \lambda_c (1 - \sigma\upsilon\nu 180^\circ)$

$\lambda' - \lambda = \lambda_c [1 - (-1)]$

$\lambda' - 8\lambda_c = 2 \cdot \lambda_c$

$\boxed{\lambda' = 10 \cdot \lambda_c}$

2. $K_\Phi = h \cdot f = \frac{h \cdot c}{\lambda} = \frac{h \cdot c}{8 \cdot \lambda_c} = \frac{h \cdot c}{8 \cdot \frac{h}{m_e \cdot c}} = \frac{1}{8} m_e \cdot c^2$

$K'_\Phi = h \cdot f' = \frac{h \cdot c}{\lambda'} = \frac{h \cdot c}{10 \cdot \lambda_c} = \frac{h \cdot c}{10 \cdot \frac{h}{m_e \cdot c}} = \frac{1}{10} \cdot m_e \cdot c^2$

$K_e = K_\Phi - K'_\Phi = \frac{1}{8} \cdot m_e \cdot c^2 - \frac{1}{10} \cdot m_e \cdot c^2$

$K_e = \frac{1}{40} m_e c^2 = \frac{1}{40} \cdot 5 \cdot 10^5 \cdot eV$

$\boxed{K_e = 12.500\ eV}$

Γ3. $\lambda_1 = 400\ nm$

$\Phi = 1,4\ eV = 1,4 \cdot 1,6 \cdot 10^{-19} = 2,24 \cdot 10^{-19}\ J$

$E_{min} = \Phi \Rightarrow h \cdot f_0 = \Phi \Rightarrow f_0 = \frac{\Phi}{h}$

$f_0 = \frac{2,24 \cdot 10^{-19}}{6,4 \cdot 10^{-34}} = 0,35 \cdot 10^{15}\ Hz$

Γ4. $K_{max} = e \cdot V_0$

$K_{max} = h \cdot f_1 - h \cdot f_0$

$\Big\} \Rightarrow e \cdot V_0 = h \cdot (f_1 - f_0)$

Και ότι:

$c = \lambda_1 \cdot f_1$

$f_1 = \frac{c}{\lambda_1}$

$f_1 = \frac{3 \cdot 10^8}{400 \cdot 10^{-9}}$

$f_1 = \frac{3 \cdot 10^8}{4 \cdot 10^{-7}}$

$f_1 = 0,75 \cdot 10^{15}\ Hz$

$1,6\ 10^{-19} \cdot V_0 = 6,4 \cdot 10^{-34} (0,75 - 0,35) \cdot 10^{15}$

$1,6 \cdot 10^{-19} \cdot V_0 = 2,56 \cdot 10^{-19}$

$V_0 = \frac{2,56}{1,6}$

$\boxed{V_0 = 1,6\ V}$

ΘΕΜΑ Δ

ΘΕΜΑ Δ στον άξονα ΝΛ

Δ1) $\Sigma F = 0$

$F - W_2 - T = 0$

$3 - 1 = T$

$\boxed{T = 2N}$

$W_2 = m_2 \cdot g = 0,1 \cdot 10$

$W_2 = 1N$

Στο σώμα m_1:

$\Sigma F = 0$

$T - W_1 - F_{ελ} = 0$

$2 - 1 = F_{ελ}$

$\boxed{F_{ελ} = 1N}$

$W_1 = m_1 \cdot g = 0,1 \cdot 10$

$W_1 = 1N$

$k = m_1 \cdot \omega^2$

$10 = 0,1 \cdot \omega^2$

$\boxed{\omega = 10 \text{ rad/s}}$

οπότε

$F_{ελ} = k \cdot x$

$1 = 10 \cdot x$

$\boxed{x = 0,1 m}$

Θ.Ι. του m_1

$\Sigma F = 0 \Rightarrow W_1 = F_{ελ} \Rightarrow$

$m_1 \cdot g = k \cdot \Delta l$

$\boxed{\Delta l = 0,1 m}$

Άρα

$A = \Delta l + x$

$A = 0,2 m$

Επειδή το σώμα για $t_0 = 0$ είναι στην αμφιαία θέση έχαμε αρχική φάση $\phi_0 = \frac{\pi}{2}$ rad

Άρα, $\boxed{x = 0,2 \cdot \eta\mu\left(10t + \frac{\pi}{2}\right)}$

$\Delta_2)$

$$\frac{K}{E} = \frac{3}{4}$$

$$\frac{E-U}{E} = \frac{3}{4}$$

$$\frac{U}{E} = \frac{4}{4} - \frac{3}{4}$$

$$\frac{U}{E} = \frac{1}{4}$$

$$\frac{\frac{1}{2}Kx^2}{\frac{1}{2}KA^2} = \frac{1}{4}$$

$$\frac{x^2}{A^2} = \frac{1}{4}$$

$$\left(\frac{x}{A}\right)^2 = \left(\frac{1}{2}\right)^2$$

$$\frac{|x|}{0,2} = \frac{1}{2}$$

$$|x| = \frac{0,2}{2}$$

$$|x| = 0,1\ m$$

$$a = \omega^2 \cdot x = 10^2 \cdot 0,1 = 10\ m/s^2$$

Δ3) Ο αγωγός θα κινηθεί προς τα πάνω με επιταχυνόμενη κίνηση με φορά προς τα αριστερά επιταχυνόμενη και όταν μηδενιστεί η επιτάχυνση αποκτά μέγιστη ταχύτητα (U_{op})

$$\Sigma F = 0$$

$$F - W_2 - F_L = 0$$

$$3 - 1 = F_L$$

$$F_L = 2\,N$$

$$B\,I\,l = 2$$

$$B \cdot \frac{B\,U_{op}\,l}{R + R_{NA}} \cdot l = 2$$

$$\frac{1 \cdot 1 \cdot U_{op} \cdot 1 \cdot 1}{1+1} = 2$$

$$\boxed{U_{op} = 4\ m/s}$$

Δ4. $\Delta t = 0,125$ sec

$U_{op} = 4$ m/s

$U_{op} = \frac{\Delta x}{\Delta t}$

$\Delta x = U_{op} \cdot \Delta t$

$\Delta x = 4 \cdot 0,125$

$\boxed{\Delta x = 0,5 \text{ m}}$

• $W_F = F \cdot \Delta x$

$W_F = 3 \cdot 0,5$

$W_F = 1,5$ J

• $Q = W_{F_L} = F_L \cdot \Delta x = 2 \cdot 0,5$

$Q = W_{F_L} = 1$ J

$\pi\% = \frac{Q}{W_F} 100\% = \frac{1}{1,5} 100\% \simeq 66,6\%$

Επιμέλεια Απαντήσεων:
Η Ομάδα του Ομίλου Ευκλείδη