Φυσική Γ΄ λυκείου
θετικής - τεχνολογικής κατεύθυνσης

Θέμα 1ο

1. → δ **2.** → α **3.** → γ **4.** → δ

5. → α – Λ, β – Λ, γ – Λ, δ – Σ, ε – Σ

Θέμα 2ο

1. Σωστό το β.

$$\left.\begin{array}{l} E = 100\eta\mu 2\pi(12\cdot 10^{12}t - 6\cdot 10^4 x) \\ E = E_{max}\eta\mu 2\pi\left(\dfrac{t}{T} - \dfrac{x}{\lambda}\right) \end{array}\right\} \Rightarrow$$

$$\Rightarrow \begin{cases} \dfrac{t}{T} = 12\cdot 10^{12}t \Rightarrow \dfrac{1}{T} = 12\cdot 10^{12} \Rightarrow f = 12\cdot 10^{12}\,Hz \\ \dfrac{x}{\lambda} = 6\cdot 10^4 x \Rightarrow \lambda = \dfrac{1}{6\cdot 10^4}\,m \end{cases}$$

$$\upsilon = \lambda\cdot f = \frac{1}{6\cdot 10^4}\cdot 12\cdot 10^{12} \Rightarrow \upsilon = 2\cdot 10^8\,m/s$$

$$n = \frac{c}{\upsilon} = \frac{3\cdot 10^8}{2\cdot 10^8} \Rightarrow n = 1{,}5$$

2. Σωστό το α.

$$\frac{U_E}{U_B} = \frac{U_E}{E - U_E} = \frac{\dfrac{q^2}{2C}}{\dfrac{Q^2}{2C} - \dfrac{q^2}{2C}} = \frac{q^2}{Q^2 - q^2} = \frac{\left(\dfrac{Q}{3}\right)^2}{Q^2 - \left(\dfrac{Q}{3}\right)^2} \Rightarrow \frac{U_E}{U_B} = \frac{\dfrac{Q^2}{9}}{8\dfrac{Q^2}{9}} \Rightarrow \frac{U_E}{U_B} = \frac{1}{8}$$

3. Σωστό το γ.

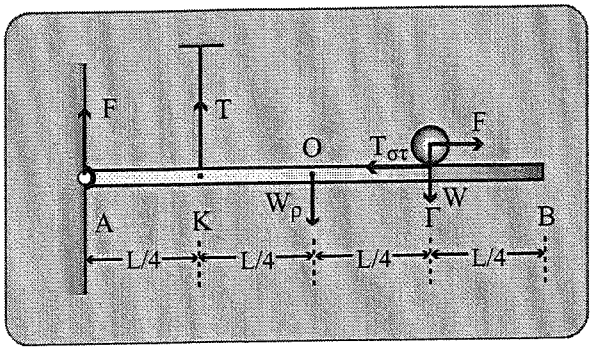
$\omega_1 = 998\pi \Rightarrow 2\pi f_1 = 998\pi \Rightarrow f_1 = 499\,Hz$

$\omega_2 = 1002\pi \Rightarrow 2\pi f_2 = 1002\pi \Rightarrow f_2 = 501\,Hz$

Ο χρόνος μεταξύ δύο διαδοχικών μηδενισμών του πλάτους είναι η περίοδος T_δ του διακροτήματος.

Είναι $T_\delta = \dfrac{1}{|f_1 - f_2|} = \dfrac{1}{|499 - 501|} \Rightarrow T_\delta = \dfrac{1}{2} = 0{,}5\,s$

Θέμα 3ο



α. $\Sigma\tau(A) = 0$

$$T\cdot\frac{L}{4} - w_\rho\cdot\frac{L}{2} - w\cdot\frac{3L}{4} = 0$$

$$\frac{T}{4} - \frac{m\cdot g}{2} - \frac{3m\cdot g}{4} = 0$$

$$T = 2Mg + 3mg$$
$$T = 2\cdot 2\cdot 10 + 3\cdot 2{,}5\cdot 10$$
$$T = 40 + 75$$
$$T = 115\,N$$

β. $\Sigma\tau = I\cdot\alpha_{\gamma\omega\nu} \Rightarrow T_{\sigma\tau}\cdot r = \frac{2}{5}mr^2\cdot\alpha_{\gamma\omega\nu} \Rightarrow T_{\sigma\tau} = \frac{2}{5}mr\cdot\alpha_{\gamma\omega\nu} \Rightarrow T_{\sigma\tau} = \frac{2}{5}m\cdot\alpha_{cm}$

$$\Sigma F_x = m\cdot\alpha_{cm} \Rightarrow F - T_{\sigma\tau} = m\cdot\alpha_{cm} \Rightarrow F - \frac{2}{5}m\cdot\alpha_{cm} = m\cdot\alpha_{cm} \Rightarrow F = \frac{7}{5}m\cdot\alpha_{cm} \Rightarrow$$

$$\Rightarrow \alpha_{cm} = \frac{5F}{7m} \Rightarrow \alpha_{cm} = \frac{5\cdot 7}{7\cdot 2{,}5}\ \alpha_{cm} = 2\,m/s^2$$

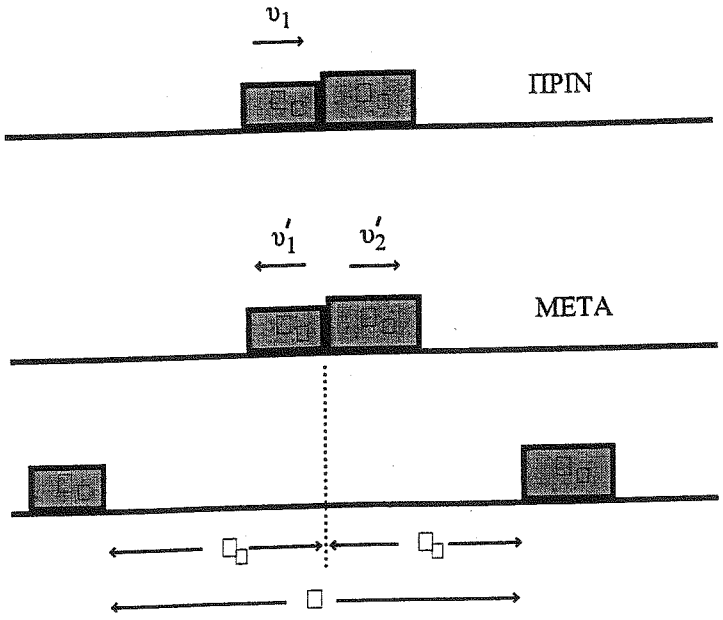
γ. $x = \frac{1}{2}\alpha_{cm}\cdot t^2 \Rightarrow t = \sqrt{\frac{2x}{\alpha_{cm}}} \Rightarrow t = \sqrt{\frac{2\cdot\frac{L}{4}}{\alpha_{cm}}} \Rightarrow \sqrt{\frac{2\cdot\frac{4}{4}}{2}} \Rightarrow t = 1\,sec$

$$\upsilon_{cm} = \alpha_{cm}\cdot t = 2\cdot 1 = 2\,m/s$$

δ. $L_\sigma = I\cdot\omega \Rightarrow L_\sigma = \frac{2}{5}mr^2\cdot\frac{\upsilon_{cm}}{r} \Rightarrow L_\sigma = \frac{2}{5}mr\cdot\upsilon_{cm}$

$$\Rightarrow L_\sigma = \frac{2}{5}\cdot 2{,}5\cdot 0{,}2\cdot 2 = 0{,}4\,Kg\cdot m^2/s$$

Θέμα 4ο



α. $\upsilon_1' = \frac{m_1 - m_2}{m_1 + m_2}\upsilon_1 \Rightarrow -9 = \frac{m_1 - m_2}{m_1 + m_2}15 \Rightarrow$

$$\Rightarrow -9m_1 - 9m_2 = 15m_1 - 15m_2 \Rightarrow 15m_2 - 9m_2 = 15m_1 + 9m_1 \Rightarrow$$

$$\Rightarrow 6m_2 = 24m_1 \Rightarrow \frac{m_1}{m_2} = \frac{6}{24} \Rightarrow \frac{m_1}{m_2} = \frac{1}{4}$$

β. $\upsilon_2' = \frac{2m_1}{m_1 + m_2}\upsilon_1 \Rightarrow \upsilon_2' = \frac{2m_1}{m_1 + 4m_1}\upsilon_1 = \frac{2m_1}{5m_1}15 = 6\,m/s$

γ. $\Pi = \dfrac{\frac{1}{2}m_2\upsilon_2'^2}{\frac{1}{2}m_1\upsilon_1^2} = \dfrac{4m_1 6^2}{m_1 15^2} = \dfrac{144}{225} = 0{,}64 \rightarrow 64\%$

δ. Θ. Μ. Κ. Ε για το πρώτο σώμα

$$\Sigma W = \Delta K \Rightarrow W_T = K_{\tau\varepsilon\lambda} - K_{\alpha\rho\chi} \Rightarrow -T \cdot x_1 = -\frac{1}{2}m_1\upsilon_1'^2 \Rightarrow$$

$$\Rightarrow \mu m_1 g x_1 = \frac{1}{2}m_1\upsilon_1'^2 \Rightarrow 0{,}1 \cdot 10 \cdot x_1 = \frac{1}{2}9^2 \Rightarrow x_1 = 40{,}5\,\text{m}$$

Θ. Μ. Κ. Ε για το δεύτερο σώμα

$$\Sigma W = \Delta K \Rightarrow W_T = K_{\tau\varepsilon\lambda} - K_{\alpha\rho\chi} \Rightarrow -T \cdot x_2 = -\frac{1}{2}m_2\upsilon_2'^2 \Rightarrow$$

$$\Rightarrow \mu m_2 g x_2 = \frac{1}{2}m_2\upsilon_2'^2 \Rightarrow 0{,}1 \cdot 10 \cdot x_2 = \frac{1}{2}6^2 \Rightarrow x_2 = 18\,\text{m}$$

και $d = x_1 + x_2 = 40{,}5 + 18 = 58{,}5\,\text{m}$