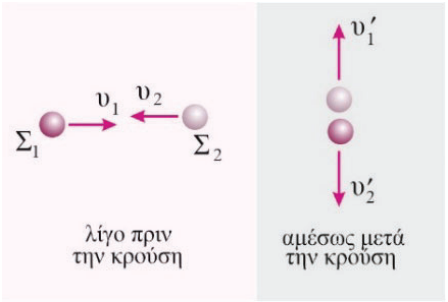
Λύσεις κριτηρίου 7

ΘΕΜΑ Α

Α1. (δ) **Α2.** (α) **Α3.** (β) **Α4.** (γ) **Α5.** α. Λ β. Λ γ. Σ δ. Σ ε. Σ

ΘΕΜΑ Β

Β1. (iii)



$$K_2 = 3K_1 \Rightarrow \frac{1}{2}m_2\upsilon_2^{\,2} = 3\frac{1}{2}m_1\upsilon_1^{\,2} \quad (1)$$

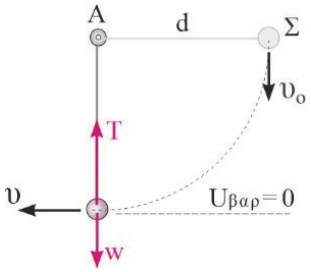
$$\text{ΑΔΟ(x)}: P_{\alpha\rho\chi,x} = P_{\tau\epsilon\lambda,x} \Rightarrow m_1\upsilon_1 - m_2\upsilon_2 = 0 \quad (2)$$

Από (1) και (2) προκύπτει:

$$\upsilon_2 = 3\upsilon_1 \quad \text{και} \quad m_1 = 3m_2$$

$$\text{ΑΔΟ(y)}: P_{\alpha\rho\chi,y} = P_{\tau\epsilon\lambda,y} \Rightarrow 0 = m_1\upsilon_1' - m_2\upsilon_2' \Rightarrow \upsilon_2' = 3\upsilon_1'$$

Β2. (ii)

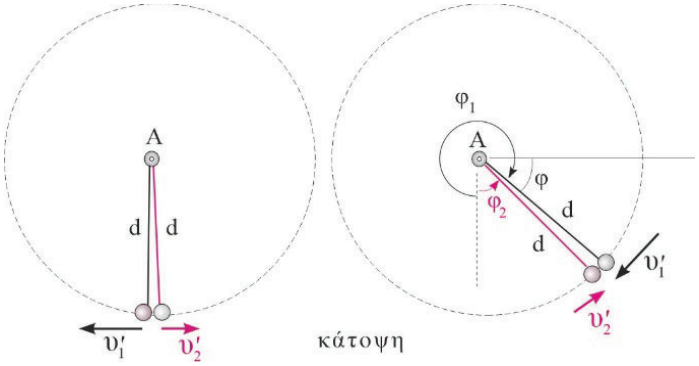


$$F_\kappa = T - w = \frac{m\upsilon^2}{d} \Rightarrow 4mg - mg = \frac{m\upsilon^2}{d} \Rightarrow \upsilon = \sqrt{3gd}$$

$$\text{ΑΔΜΕ}: \frac{1}{2}m\upsilon_0^{\,2} + mgd = \frac{1}{2}m\upsilon^2 \Rightarrow \upsilon_0 = \sqrt{gd}$$

$$\frac{L'}{L} = \frac{m\upsilon d}{m\upsilon_0 d} = \frac{\upsilon}{\upsilon_0} \Rightarrow L' = L\sqrt{3}$$

Β3. (i)



$$L_2 = 2L_1 \Rightarrow m_2|\upsilon_2|d = 2m_1|\upsilon_1|d \Rightarrow$$

$$|\upsilon_2| = |\upsilon_1|$$

$$\upsilon_1' = \frac{m_1 - m_2}{m_1 + m_2}\upsilon_1 + \frac{2m_2}{m_1 + m_2}\upsilon_2 \Rightarrow$$

$$\upsilon_1' = -\frac{5}{3}\upsilon_1 \quad (\upsilon_2 = -\upsilon_1)$$

$$\upsilon_2' = \frac{2m_1}{m_1 + m_2}\upsilon_1 + \frac{m_2 - m_1}{m_1 + m_2}\upsilon_2 \Rightarrow$$

$$\upsilon_2' = \frac{1}{3}\upsilon_1$$

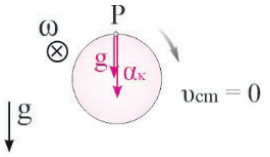
$$\varphi_1 + \varphi_2 = 2\pi \Rightarrow \omega_1 t + \omega_2 t = \frac{|\upsilon_1'|}{d}t + \frac{\upsilon_2'}{d}t = 2\pi \Rightarrow t = \frac{\pi d}{\upsilon_1}, \quad \varphi_2 = \omega_2 t = \frac{\upsilon_2'}{d}t = \frac{\upsilon_1}{3d}\frac{\pi d}{\upsilon_1} \Rightarrow \varphi_2 = \frac{\pi}{3}\text{rad}$$

$$\varphi = \frac{\pi}{2} - \varphi_2 = \frac{\pi}{6} \Rightarrow \varphi = 30^0$$

ΘΕΜΑ Γ

Γ1. $y = \upsilon_0 t - \frac{1}{2}gt^2 = 0 \Rightarrow t = \frac{2\upsilon_0}{g} = 2s\,,\ \theta = \omega t = 80rad,\ N = \frac{\theta}{2\pi} = \frac{40}{\pi}$ στροφές

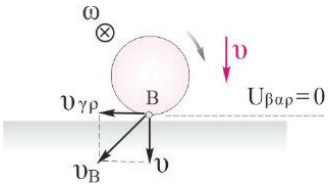
Γ2. $\alpha_P = \alpha_\kappa + g = \omega^2 r + g = 170 m/s^2$



Γ3. $A\Delta ME: \frac{1}{2}m\upsilon_0^{\,2} + 0 = \frac{1}{2}m\upsilon^2 + 0 \Rightarrow \upsilon = \upsilon_0 = 10 m/s$

$\upsilon_B = \sqrt{\upsilon_{\gamma\rho}^{\,2} + \upsilon^2} = \sqrt{(\omega r)^2 + \upsilon^2} \Rightarrow \upsilon_B = \sqrt{116} m/s$

$\varepsilon\varphi\vartheta = \frac{\upsilon}{\upsilon_{\gamma\rho}} = 2,5$

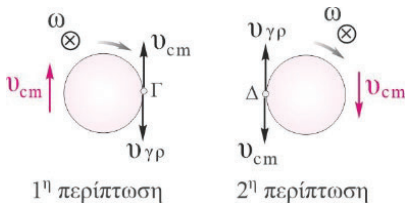


Γ4. 1η περίπτωση:

$\upsilon_\Gamma = \upsilon_{cm} - \upsilon_{\gamma\rho} = 0 \Rightarrow \upsilon_0 - gt_1 = \omega r \Rightarrow t_1 = 0,6s$

2η περίπτωση:

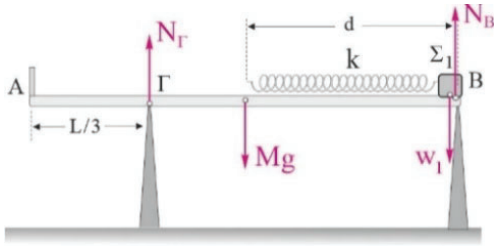
$\upsilon_\Delta = |\upsilon_{cm}| - \upsilon_{\gamma\rho} = 0 \Rightarrow |\upsilon_0 - gt_2| = gt_2 - \upsilon_0 = \omega r \Rightarrow t_2 = 1,4s$



ΘΕΜΑ Δ

Δ1. $\Sigma\tau_{(B)} = 0 \Rightarrow Mg\frac{L}{2} = N_\Gamma \frac{2L}{3} \Rightarrow M = 4kg$

$\Sigma F = 0 \Rightarrow N_B + N_\Gamma = Mg + m_1 g \Rightarrow m_1 = 3,9kg$

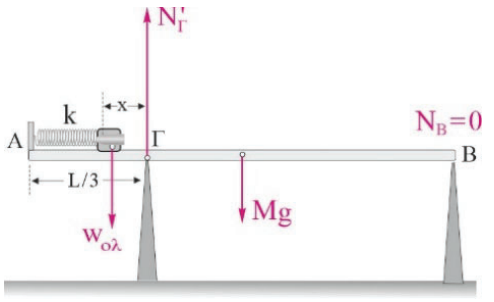


Δ2. $\Sigma\tau_{(\Gamma)} = 0 \Rightarrow Mg\frac{L}{6} = (m_1 + m_2)gx \Rightarrow$

$x = \frac{L}{6} = 0,5m$

αριστερά του σημείου Γ.

$T = \mu N = \mu(m_1 + m_2)g = 10N$



$\Theta MKE: 0 - \frac{1}{2}(m_1 + m_2)V^2 = -T(\frac{2L}{3} + x) - \frac{1}{2}k(\frac{L}{2} - \frac{L}{3} + x)^2 \Rightarrow V = 5m/s$

Δ3. $\text{ΑΔΟ}: m_2\upsilon_0 = (m_1 + m_2)V \Rightarrow \upsilon_0 = 200\text{m/s}$

$$Q_1 = \frac{1}{2}m_2{\upsilon_0}^2 - \frac{1}{2}m_{12}V^2 = 1950\text{J} \quad , \quad Q_2 = |W_T| = T\left(\frac{2L}{3} + x\right) \Rightarrow Q_2 = 25\text{J}$$

$$Q_{ολ} = Q_1 + Q_2 = 1975\text{J} \quad \text{ή} \quad Q_{ολ} = E_{αρχ} - E_{τελ} = \frac{1}{2}m_2{\upsilon_0}^2 - \frac{1}{2}k\left(\frac{L}{3}\right)^2 \Rightarrow Q_{ολ} = 1975\text{J}$$

Δ4. $\text{ΘΜΚΕ}: \frac{1}{2}(m_1 + m_2)\upsilon^2 - \frac{1}{2}(m_1 + m_2)V^2 = -T\frac{L}{2} \Rightarrow \upsilon = \sqrt{17,5}\text{m/s}$

$$\frac{dQ}{dt} = \frac{d|W_T|}{\Delta t} = \frac{Tdx}{dt} = T\upsilon \Rightarrow \frac{dQ}{dt} = 42\text{J/s}$$