Λύσεις Β Λυκείου 08-12-2024

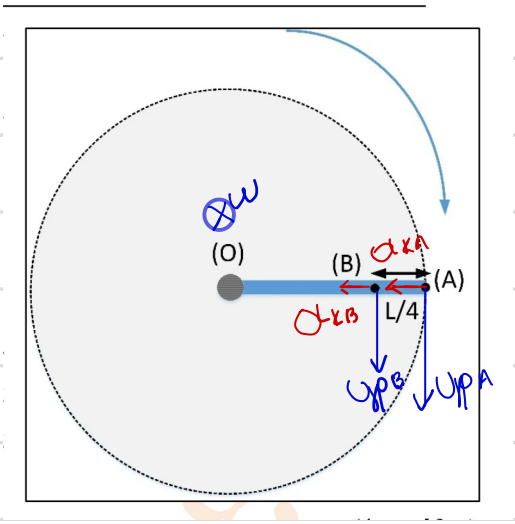
Θέμα Α

Α1) β Α2) β Α3)δ Α4)α

Α5) α) Λ β) Σ γ) Σ δ) Λ ε)Σ

Θέμα Β

Β1) i)



ii) Σωστή απάντηση:(α)

Τα σημεία έχουν την ίδια γωνιακή ταχύτητα.

$$\frac{a_1}{a_2} = \frac{\omega^2 \cdot R_A}{\omega^2 \cdot R_B} = \frac{L}{L - \frac{L}{4}} = \frac{L}{\frac{3L}{4}}$$

$$\Rightarrow \boxed{\frac{a_1}{a_2} = \frac{4}{3}}$$

Β2) Σωστή απάντηση:(β)

$$\Sigma F_y = 0 \Rightarrow N = W \Rightarrow N = m \cdot g$$

Η οριακή τριβή που δέχεται το σώμα και δρα ως κεντρομόλος δύναμη:

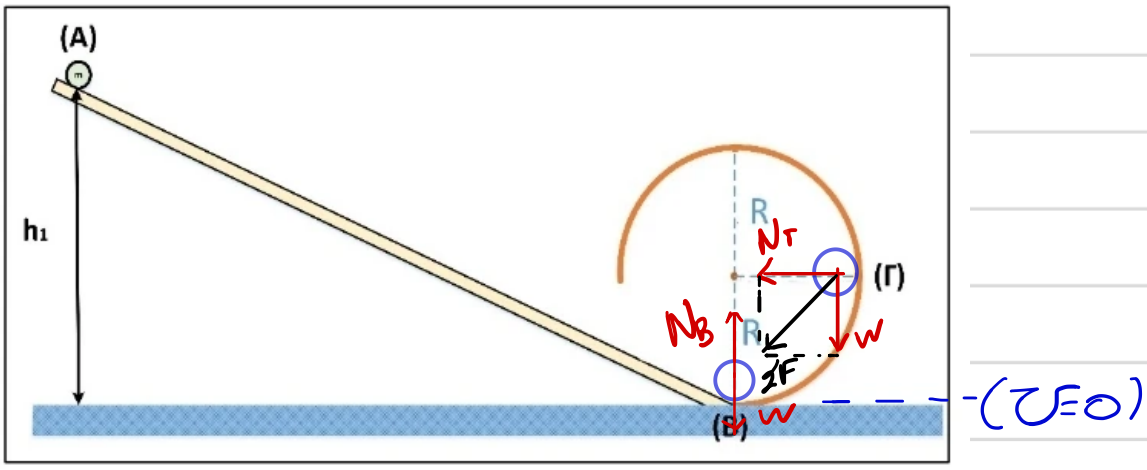
$$T_{s(max)} = \mu_s \cdot N = \mu_s \cdot mg$$

Όμως: $\Sigma F_R = m \cdot \frac{U_{max}^2}{R} \Rightarrow T_{s(max)} = m \cdot \frac{(2\pi R f)^2}{R}$

$$\Rightarrow \mu_s \cdot m \cdot g = m \cdot \frac{4\pi^2 \cdot R^2 \cdot f^2}{R} \Rightarrow \mu_s \cdot g = 4\pi^2 \cdot R \cdot \left(\frac{1}{4\pi}\sqrt{\frac{g}{R}}\right)^2$$

$$\Rightarrow \mu_s \cdot g = 4\pi^2 \cdot R \cdot \frac{1}{16\pi^2} \cdot \frac{g}{R} \Rightarrow \boxed{\mu_s = \frac{1}{4} = 0{,}25}$$

B3)



i)Σωστή απάντηση:(β)

Στη Θέση (Β): $\Sigma F_R = m\cdot\frac{U_B^2}{R} \Rightarrow N_B - mg = m\cdot\frac{U_B^2}{R}$

$\Rightarrow 9\,m\cdot g - mg = m\cdot\frac{U_B^2}{R}$

$\Rightarrow 8mg = m\cdot\frac{U_B^2}{R} \Rightarrow U_B = \sqrt{8gR}$

- Α.Δ.Μ.Ε. (Α→Β)

$K_A + U_A = K_B + U_B \Rightarrow 0 + m\cdot g\cdot h_1 = \frac{1}{2}m\cdot U_B^2 + 0$

$\Rightarrow g\cdot h_1 = \frac{1}{2}(\sqrt{8gR})^2 \Rightarrow g\cdot h_1 = \frac{8gR}{2} \Rightarrow \boxed{h_1 = 4\cdot R}$

ii)Σωστή απάντηση:(γ)

Εφαρμόζουμε Α.Δ.Μ.Ε. (Α→Γ):

$K_A + U_A = K_\Gamma + U_\Gamma \Rightarrow 0 + mgh_1 = \frac{1}{2}m\cdot U_\Gamma^2 + mg\cdot R$

$\Rightarrow g\cdot 4R - g\cdot R = \frac{U_\Gamma^2}{2} \Rightarrow 3gR = \frac{U_\Gamma^2}{2} \Rightarrow U_\Gamma = \sqrt{6gR}$

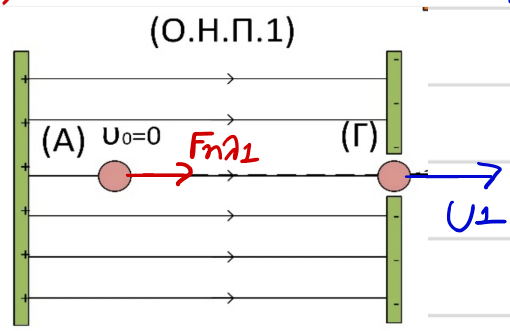
Στη Θέση (Γ): $\Sigma F_R = m\cdot\frac{U_\Gamma^2}{R} \Rightarrow \Sigma F_R = m\cdot\frac{(\sqrt{6gR})^2}{R} = 6mg$

Άρα: $\Sigma F = \sqrt{T_{v_r}^2 + w^2} = \sqrt{(6mg)^2 + (mg)^2} \Rightarrow \Sigma F = \sqrt{37m^2g^2}$

$\Rightarrow \boxed{\Sigma F = mg\sqrt{37}}$

Θέμα Γ

Γ1)



$F_{ηλ_1} = \epsilon_1 \cdot |q| = 10 \cdot 2 \cdot 10^{-6} = 2 \cdot 10^{-5} N$

$\alpha_1 = \frac{F_{ηλ}}{m} = \frac{2 \cdot 10^{-5}}{10^{-8}} \Rightarrow \boxed{\alpha_1 = 2 \cdot 10^3 m/s^2}$

Γ2) $\epsilon_1 = \frac{V_{AΓ}}{(AΓ)} \Rightarrow (AΓ) = \frac{V_{AΓ}}{\epsilon_1} = \frac{4}{10} \Rightarrow \boxed{(AΓ) = 0,4 m}$

$\cdot (AΓ) = \frac{1}{2} \alpha \cdot \Delta t_1^2 \Rightarrow 0,4 = \frac{1}{2} \cdot 2 \cdot 10^3 \cdot \Delta t_1^2 \Rightarrow \Delta t_1^2 = \frac{4 \cdot 10^{-1}}{10^3}$

$\Rightarrow \Delta t_1 = \sqrt{4 \cdot 10^{-4}} \Rightarrow \boxed{\Delta t_1 = 2 \cdot 10^{-2} s}$

Γ3) $U_1 = \alpha_1 \cdot \Delta t_1 = 2 \cdot 10^3 \cdot 2 \cdot 10^{-2} \Rightarrow \boxed{U_1 = 40 m/s}$

Γ4) $\cdot F_{ηλ_2} = \epsilon_2 \cdot |q| = 40 \cdot 2 \cdot 10^{-6} \Rightarrow F_{ηλ_2} = 8 \cdot 10^{-5} N$

$\alpha_2 = \frac{F_{ηλ_2}}{m} = \frac{8 \cdot 10^{-5}}{10^{-8}} \Rightarrow \alpha_2 = 8 \cdot 10^3 m/s^2$

$\cdot L = U_1 \cdot \Delta t_2 \Rightarrow \Delta t_2 = \frac{L}{U_1} = \frac{0,4}{40} \Rightarrow \boxed{\Delta t_2 = 10^{-2} s}$

$U_x = U_1 = 40 m/s$

$U_y = \alpha_2 \cdot \Delta t_2 = 8 \cdot 10^3 \cdot 10^{-2} = 80 m/s$

$\Rightarrow U = \sqrt{U_x^2 + U_y^2}$

$\Rightarrow U = \sqrt{40^2 + (2 \cdot 40)^2}$

$\Rightarrow \boxed{U = 40\sqrt{5} m/s}$

Κατεύθυνση: $\boxed{\varepsilon\varphi\theta = \frac{U_y}{U_x} = 2}$

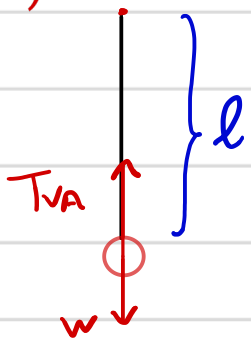
Γ5) Το σωματίδιο εισέρχεται από το μέσο της απόστασης των δύο οπλισμών, άρα:

$\frac{y}{2} = \frac{1}{2} \alpha_2 \cdot \Delta t_2^2 \Rightarrow y = 8 \cdot 10^3 \cdot (10^{-2})^2 \Rightarrow y = 0,8 m$

Άρα: $\epsilon_2 = \frac{V}{y} \Rightarrow V = \epsilon_2 \cdot y \Rightarrow V = 40 \cdot 0,8 \Rightarrow \boxed{V = 32 V}$

Θέμα Δ

Δ1)

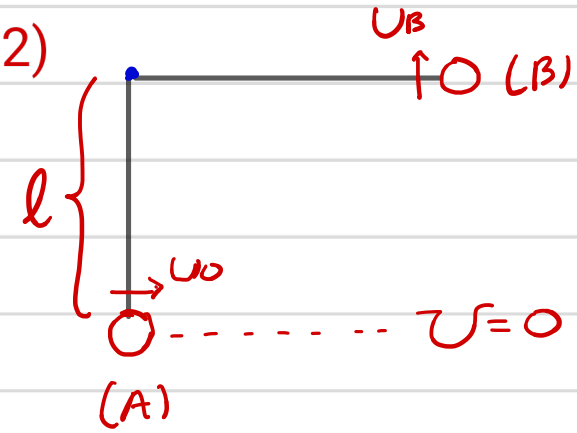


$$\Sigma F_{RA} = m\cdot\frac{U_0^2}{\ell} \Rightarrow \Sigma F_{RA} = 4\cdot\frac{10^2}{1} = 400N$$

$$w = m\cdot g = 40N$$

$$\Sigma F_{RA} = T_{VA} - w \Rightarrow 400 = T_{VA} - 40 \Rightarrow \boxed{T_{VA} = 440N}$$

Δ2)



$$\frac{Α.Δ.Μ.Ε.(A\to B)}{K_A + U_A = K_B + U_B}$$

$$\Rightarrow \frac{1}{2}m\cdot U_0^2 + 0 = \frac{1}{2}m\cdot U_B^2 + mg\ell$$

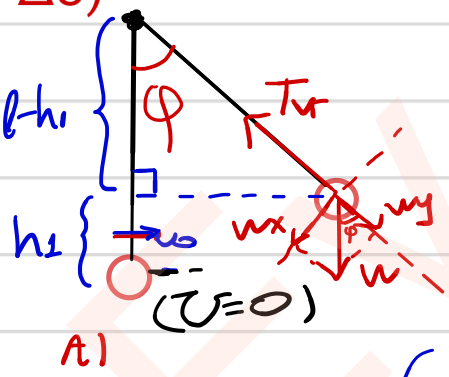
$$\Rightarrow U_0^2 = U_B^2 + 2g\ell$$

$$\Rightarrow 10^2 = U_B^2 + 20$$

$$\Rightarrow U_B^2 = 80 \Rightarrow U_B = \sqrt{5\cdot 16}$$

$$\Rightarrow \boxed{U_B = 4\sqrt{5}\ m/s}$$

Δ3)



$$w_y = w\cdot\sigma\upsilon\nu\varphi = 40\cdot 0{,}8 = 32N$$

$$w_x = w\cdot\eta\mu\varphi = 40\cdot 0{,}6 = 24N$$

$$\cdot\ \sigma\upsilon\nu\varphi = \frac{\ell - h_1}{\ell} \Rightarrow 0{,}8\ell = \ell - h_1$$

$$\Rightarrow h_1 = 0{,}2\ell$$

Εφαρμόζουμε $Α.Δ.Μ.Ε.(A\to\Gamma)$:

$$K_A + U_A = K_\Gamma + U_\Gamma$$

$$\Rightarrow \frac{1}{2}m\cdot U_0^2 + 0 = \frac{1}{2}m\cdot U_\Gamma^2 + mg\,0{,}2\ell$$

$$\Rightarrow 10^2 = U_\Gamma^2 + 20\cdot 0{,}2$$

$$\Rightarrow 100 - 4 = U_\Gamma^2 \Rightarrow U_\Gamma = \sqrt{96}\ m/s$$

$$\Sigma F_{Kr} = m\cdot\frac{U_r^2}{\ell} = 4\cdot\frac{(\sqrt{96})^2}{1} \Rightarrow \Sigma F_{Kr} = 384\,N$$

Όμως: $\Sigma F_{Kr} = T_{vr} - w_y \Rightarrow 384 = T_{vr} - 32$

$\Rightarrow \boxed{T_{vr} = 416\,N}$

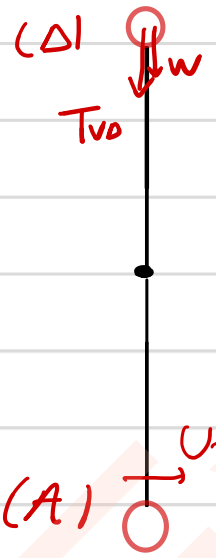
Δ4) Εύρεση ελάχιστης ταχύτητας στο Α, για ολοκλήρωση.

~ Στην ανώτερη θέση:

$$\Sigma F_K = T_v + mg \Rightarrow T_v = \frac{m\cdot U^2}{\ell} - mg \geq 0$$

$$\rightarrow \frac{m\cdot U^2}{\ell} \geq m\cdot g \Rightarrow U \geq \sqrt{g\ell}$$

Στην οριακή περίπτωση: $U_\Delta = \sqrt{g\ell}$



Α.Δ.Μ.Ε.(Α→Δ)

$$K_A + U_A = K_\Delta + U_\Delta$$

$$\Rightarrow \frac{1}{2}m\cdot U_{min}^2 + 0 = \frac{1}{2}m\cdot(\sqrt{g\ell})^2 + mg2\ell$$

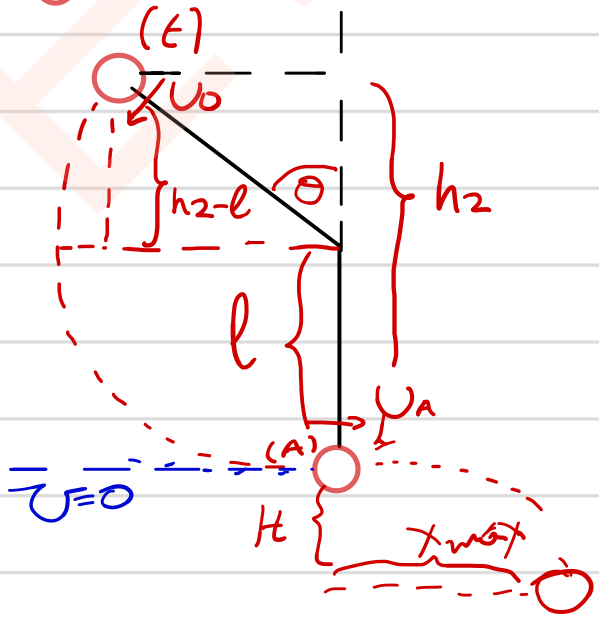
$$\Rightarrow U_{min}^2 = g\ell + 4g\ell \Rightarrow U_{min} = \sqrt{5g\ell}$$

$$\Rightarrow U_{min} = \sqrt{50}\ m/s$$

Άρα: $U_A > U_{min}$ → εκτελεί ολοκλήρωση

$$H = \frac{1}{2}\cdot g\cdot t^2 = \frac{1}{2}\cdot 10\cdot 1^2 = 5m$$

Δ5)



$$x_{max} = 4\cdot H = 20m$$

$$\rightarrow U_A\cdot t = x_{max} \Rightarrow U_A = 20\,m/s$$

Α.Δ.Μ.Ε. (Ε → Α)

$K_A + U_A = K_E + U_E$

$\Rightarrow \frac{1}{2} \cdot m \cdot U_0^2 + mg \cdot h_2 = \frac{1}{2} m \cdot U_A^2 + 0$

$\Rightarrow U_0^2 + 2g \cdot h_2 = U_A^2 \Rightarrow 19^2 + 20 h_2 = 20^2$

$\Rightarrow 361 + 20 h_2 = 400 \Rightarrow h_2 = \frac{39}{20} \Rightarrow h_2 = 1{,}95 m$

Όπότε η θέση (Ε) είναι πάνω από την οριζόντια θέση:

$\alpha\nu\theta = \frac{h_2 - \ell}{\ell} = \frac{1{,}95 - 1}{1} \Rightarrow \boxed{\alpha\nu\theta = 0{,}95}$