Διαγώνισμα *Β Τάξης Ενιαίου Λυκείου*

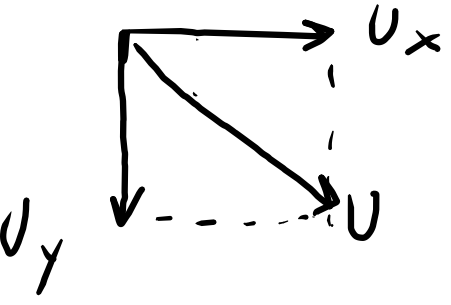
Κυριακή 8 Δεκεμβρίου 2023

Φυσική Θετικού Προσανατολισμού

Θέμα Α → (δ), (γ), (δ), (α) / Σ, Λ, Λ, Λ, Λ

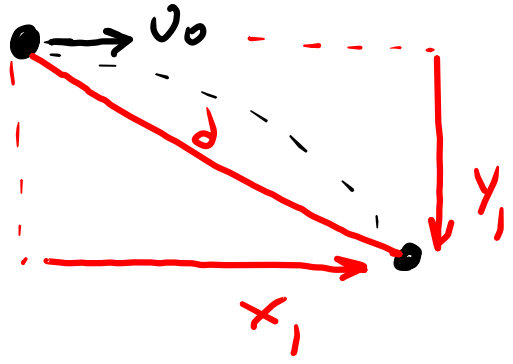
Β.1 → (Α.(α)) και (Β.(γ))

$K = 2K_0 \Rightarrow \frac{1}{2}mU^2 = 2\frac{1}{2}mU_0^2 \Rightarrow U^2 = 2U_0^2 \Rightarrow U_x^2 + U_y^2 = 2U_0^2$



όμως $U_x = U_0$ / $U_0^2 + U_y^2 = 2U_0^2 \Rightarrow U_y = U_0 \Rightarrow g t_1 = U_0$

$t_1 = \frac{U_0}{g}$



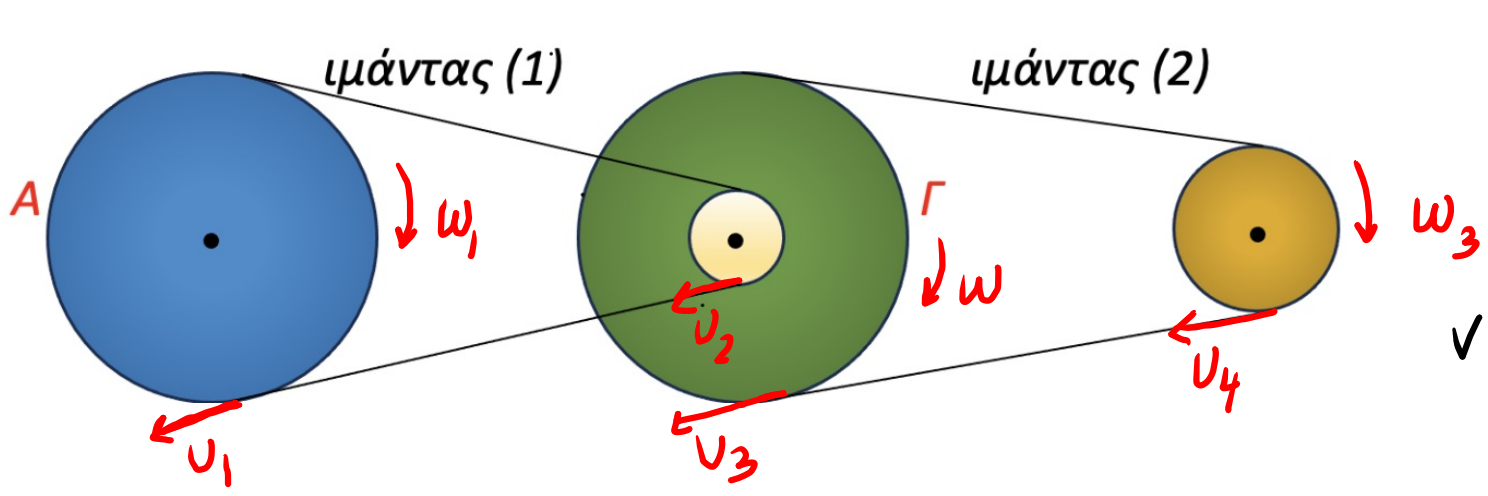
$$d^2 = x_1^2 + y_1^2 = (v_0 t_1)^2 + \left(\frac{1}{2} g t_1^2\right)^2$$

$$= \left(\frac{v_0^2}{g}\right)^2 + \left(\frac{1}{2} g \frac{v_0^2}{g^2}\right)^2 = \frac{v_0^4}{g^2} + \frac{v_0^4}{4g^2}$$

Άρα $d = \sqrt{5}\,\frac{v_0^2}{2g}$

B.2

(A. (γ)) και (B. (β))



Αφού οι ιμάντες δεν ολισθαίνουν στους δίσκους

✓ $v_1 = v_2 \Rightarrow \omega_1 R_1 = \omega \cdot r$

$\Rightarrow \omega_1 \cdot R = \omega \frac{R}{3} \Rightarrow \underline{\omega = 3\omega_1}$ (1)

✓ $v_3 = v_4 \Rightarrow \omega \cdot R = \omega_3 \frac{R}{2}$

$\Rightarrow \underline{\omega_3 = 2\omega}$ (2)

Από (1), (2) $\Rightarrow$ $\omega_3 = 6\omega_1 \Rightarrow 2\pi f_3 = 6 \cdot 2\pi f_1 \Rightarrow f_3 = 6 f_1$

$\Rightarrow \frac{N_3}{\Delta t} = 6 \frac{N_1}{\Delta t} \Rightarrow \underline{N_3 = 6N_1}$

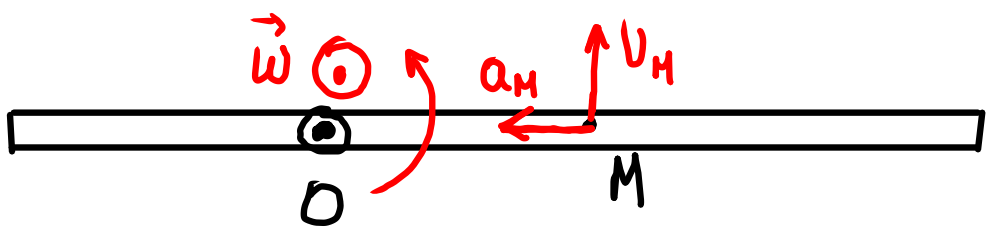
$\frac{a_1}{a_2} = \frac{\omega_1^2 R_1}{\omega^2 R_2} = \left(\frac{\omega_1}{\omega}\right)^2 \overset{(1)}{\Rightarrow} \frac{a_1}{a_2} = \frac{1}{9} \Rightarrow \underline{a_2 = 9a_1}$

Θέμα Γ

(Γ.1) $f = \frac{N}{\Delta t} = \frac{120}{60} \Rightarrow \underline{f = 2\,Hz}$

$T = \frac{1}{f} \Rightarrow \underline{T = 0,5\ sec}$

(Γ.2) $\omega = 2\pi f \Rightarrow \underline{\omega = 4\pi\ rad/s}$



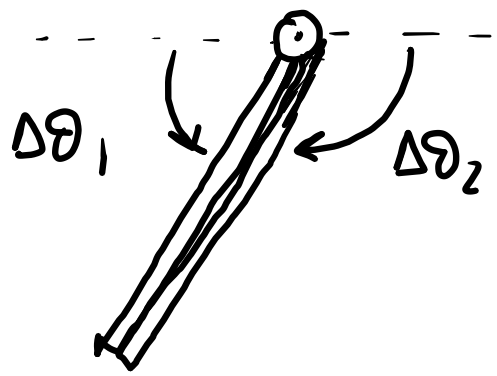
(Γ.3)

$U_M = \omega \cdot d \Rightarrow \underline{U_M = \pi\ m/s}$

$a_M = \omega^2 \cdot d \Rightarrow \underline{a_M = 4\pi^2\ m/s^2}$

(Γ.3) $\omega = \frac{\Delta\theta}{\Delta t} \Rightarrow \Delta t = \frac{\Delta\theta}{\omega} = \frac{\frac{\pi}{6}}{4\pi} \Rightarrow \Delta t = \frac{1}{24}\,s$

(Γ.4)



$$\Delta\theta_2 + \Delta\theta_1 = \pi$$

$$|\omega_1|\Delta t + |\omega_2|\Delta t = \pi$$

$$\omega\Delta t + 2\omega\Delta t = \pi$$

$$\Rightarrow \Delta t = \frac{\pi}{3\omega} \Rightarrow \Delta t = \frac{5}{6}\,sec$$

Θέμα Δ

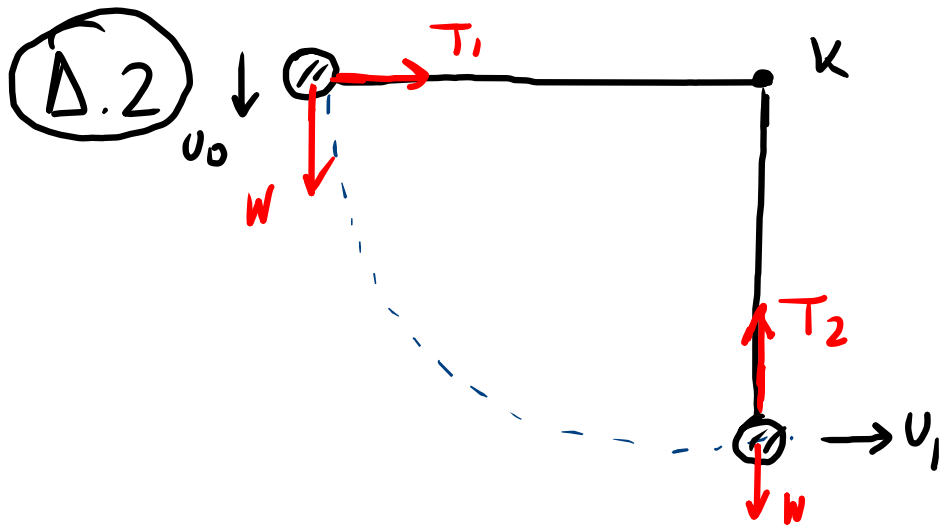
(Δ.1) ΘΜΚΕ για την μπάλα $\Delta K = \Sigma W$

$$\frac{1}{2}mv_1^2 - \frac{1}{2}mv_0^2 = W_{βαρ} + W_T \Rightarrow$$

$$\frac{1}{2}mv_1^2 - \frac{1}{2}mv_0^2 = mg\ell \Rightarrow v_1^2 = v_0^2 - 2g\ell$$

$$\Rightarrow v_1 = 4\sqrt{5}\ m/s$$

Δ.2

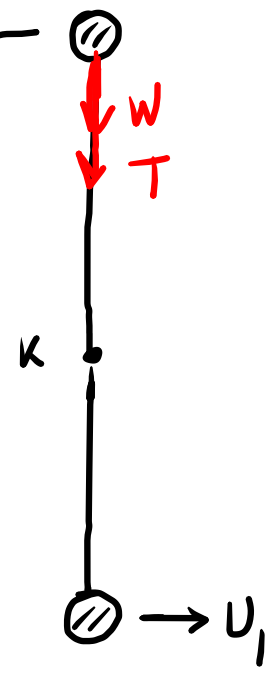


Αρχ. θέση $T_1 = ma_K = \frac{mU_0^2}{\ell} \Rightarrow \underline{T_1 = 30N}$

Τελ. θέση $T_2 - W = ma_K \Rightarrow$

$T_2 - mg = \frac{mU_1^2}{\ell} \Rightarrow \underline{T_2 = 60N}$

Δ.3



Θήκε από την κατώτερη στην ανώτερη θέση

$\frac{1}{2}mU^2 - \frac{1}{2}mU_1^2 = -mg \cdot 2\ell \Rightarrow U^2 = U_1^2 - 4g\ell$

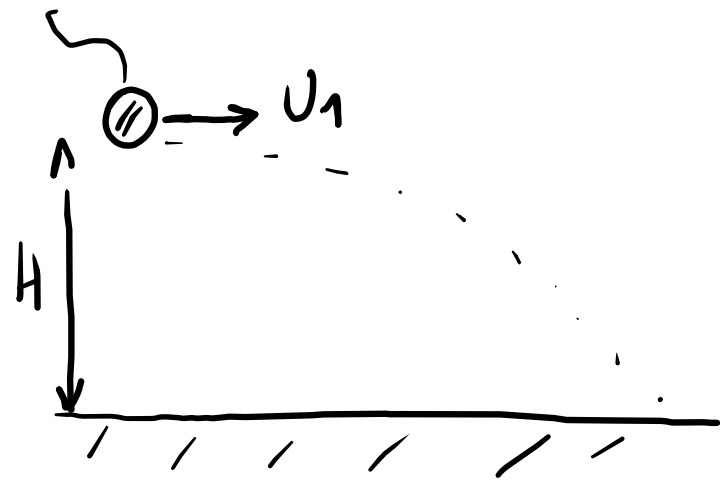
$U^2 = 16 \Rightarrow U = 4 m/s$

Στην ανώτερη θέση $W + T = ma_K \Rightarrow T + mg = \frac{mU^2}{\ell}$

$\Rightarrow T = \frac{mU^2}{\ell} - mg \Rightarrow T = 0$

Άρα οριακά το νήμα θα χαλαρώνει στην ανώτερη θέση.

Δ.4



$$H = \frac{1}{2} g (\Delta t)^2 \Rightarrow \underline{H = 1,25\,m}$$

Δ.5

$$X_{max} = U_1 \cdot \Delta t \Rightarrow \underline{X_{max} = 2\sqrt{5}\,m}$$

$$\frac{\Delta P}{\Delta t} = \Sigma F = W \Rightarrow \frac{\Delta P}{\Delta t} = mg \Rightarrow \frac{\Delta P}{\Delta t} = 10\ kg \cdot m/s$$

#perifysikhs