ΦΡΟΝΤΙΣΤΗΡΙΟ Δ.Ε «ΘΕΜΕΛΙΟ» ΕΛΕΥΣΙΝΑΣ

ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
ΗΜΕΡΗΣΙΩΝ & ΕΣΠΕΡΙΝΩΝ ΓΕΝΙΚΩΝ ΛΥΚΕΙΩΝ
ΠΑΡΑΣΚΕΥΗ 10 ΙΟΥΝΙΟΥ 2022
ΕΞΕΤΑΖΟΜΕΝΟ ΜΑΘΗΜΑ
ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ

ΕΝΔΕΙΚΤΙΚΕΣ ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α

Α1. **γ**

Α2. **δ**

Α3. **γ**

Α4. **β**

Α5. **α** Λάθος

β. Σωστό

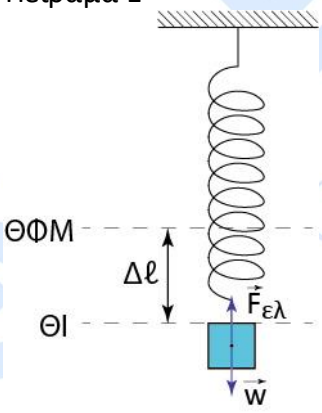
γ. Λάθος

δ. Σωστό

ε. Σωστό

ΘΕΜΑ Β

Β1. Πείραμα 1

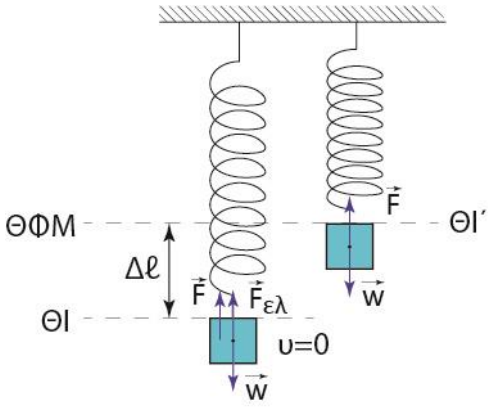


ΘΙ: $\Sigma F = 0 \rightarrow F_{ελ} = w$

$$k\Delta\ell = mg \rightarrow \Delta\ell = \frac{mg}{k}$$

Στη ΘΦΜ αφήνεται ελεύθερο (υ = 0) συνεπώς

$$A_1 = \Delta\ell = \frac{mg}{k}$$

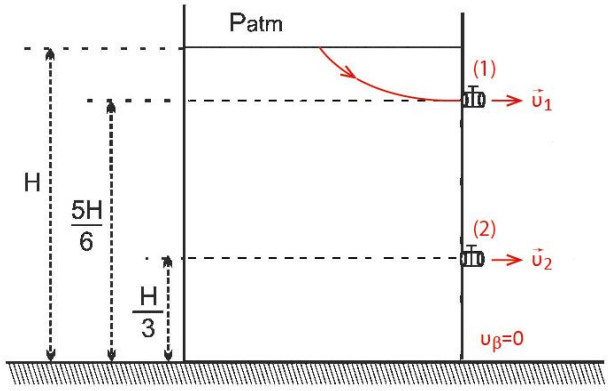


F = mg συνεπώς το σώμα εκτελεί Α.Α.Τ. γύρω από νέα ΘΙ΄ που είναι η ΘΦΜ αφού έχει $F_{ελ} = 0$ και $ΣF = F - mg = 0$.

Η αρχική θέση ισορροπίας είναι ακραία θέση ($υ = 0$) και $A2 = Δℓ = \frac{mg}{k}$

Δηλαδή $A_1 = A_2$ (I)

Β2.



Εφόσον το εμβαδόν στις οπές είναι αμελητέο σε σχέση με το εμβαδόν του δοχείου, η ταχύτητα της στάθμης του δοχείου είναι μηδενική.

Εξ. Bernoulli Α → (1)

$$P_A + \rho g H = P_1 + \frac{1}{2}\rho \upsilon_1^2 + \rho g \frac{5H}{6}$$

$$P_{atm} + \rho g \frac{H}{6} = P_{atm} + \frac{1}{2}\rho \upsilon_1^2 \rightarrow \upsilon_1 = \sqrt{\frac{gH}{3}}$$

όμοια

$$\upsilon_2 = 2\cdot\sqrt{\frac{gH}{3}} = 2\upsilon_1$$

$$\Pi_1 = A\cdot\upsilon_1 \rightarrow \frac{v}{\Delta t_1} = A\cdot\upsilon_1 \rightarrow \Delta t_1 = \frac{v}{A\cdot\upsilon_1}$$

$$\Pi_1 + \Pi_2 = A\cdot\upsilon_1 + A\cdot\upsilon_2 \rightarrow \frac{v}{\Delta t_2} = 3A\cdot\upsilon_1 \rightarrow \Delta t_2 = \frac{v}{3A\cdot\upsilon_1}$$

$$\frac{\Delta t_2}{\Delta t_1} = \frac{\frac{v}{3A\cdot\upsilon_1}}{\frac{v}{A\cdot\upsilon_1}} \rightarrow \frac{\Delta t_2}{\Delta t_1} = \frac{1}{3} \text{ (iii)}$$

Β3. $\upsilon_1' = \frac{m_1 - m_2}{m_1 + m_2}\cdot\upsilon_1$

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

ΑΔΟ $\vec{P}_1 + \vec{P}_2 = \vec{P}_1' + \vec{P}_2'$

$$P_1 - \frac{P_1}{5} = \vec{P}_2' \rightarrow \vec{P}_2' = \frac{4P_1}{5}$$

$$\rightarrow m_2\cdot\upsilon_2' = \frac{4}{5}\cdot m_1\cdot\upsilon_1$$

$$\rightarrow m_2\cdot\frac{2m_1}{m_1 + m_2}\cdot\upsilon_1 = \frac{4}{5}m_1\cdot\upsilon_1$$

$$\rightarrow \frac{2m_1}{m_1 + m_2} = \frac{4}{5}$$

$$\rightarrow 10m_2 = 4m_1 + 4m_2$$

$$\rightarrow 6m_2 = 4m_1$$

$$\rightarrow 3m_2 = 2m_1 \rightarrow m_2 = \frac{3}{2}m_1$$

$$\left[\upsilon_2' = \frac{2m_1}{m_1 + \frac{3}{2}m_1}\cdot\upsilon_1 = \frac{2m_1}{\frac{5}{2}m_1}\cdot\upsilon_1 = \frac{4}{5}\upsilon_1\right]$$

$$\frac{\Delta k_2}{k_1}\cdot 100\% = \frac{k_2'}{k_1}\cdot 100\% = \frac{\frac{1}{2}m_2\cdot \upsilon_2'^2}{\frac{1}{2}m_1\cdot \upsilon_1^2}\cdot 100\% = \frac{\frac{3}{2}m_2\cdot\left(\frac{4}{5}\upsilon_1\right)^2}{\frac{1}{2}m_1\cdot \upsilon_1^2}\cdot 100\%$$

$$= \frac{3\cdot 16}{8\cdot 25}\cdot 100\% = \frac{48}{50}\cdot 100\% = 96\% \qquad \text{(iii)}$$

ΘΕΜΑ Γ

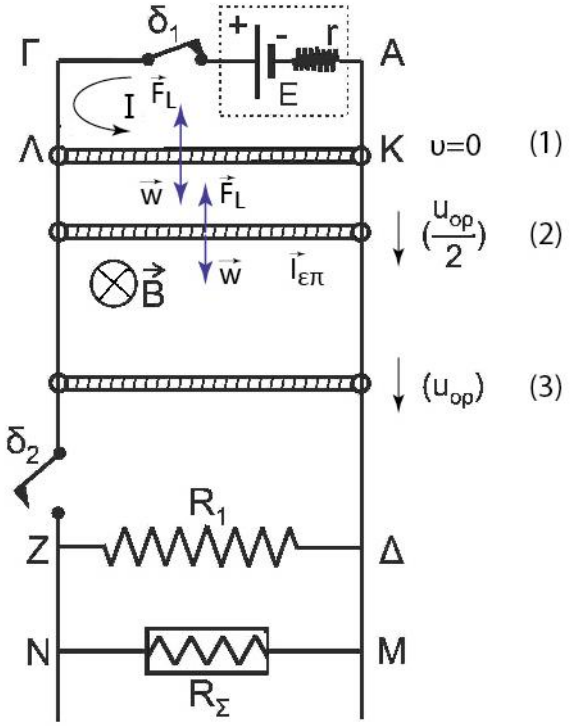
ℓ = 1 m

ε = 9 V

r = 1 Ω

m = 0,3 kg

$R_{K\Lambda}$ = 2 Ω



Γ1.

$$\left.\begin{array}{l}\Sigma F=0 \rightarrow F_L=w \rightarrow BI\ell=mg \\ I=\dfrac{\varepsilon}{R_{K\Lambda}+r}=\dfrac{9}{3}=3A\end{array}\right\} B=1T$$

Γ2.

$$\left.\begin{array}{l}R_1=3\Omega \\ v_K=6V \\ P_K=6W\end{array}\right\} P_K=\frac{V_{K^2}}{R_\Sigma} \rightarrow R_\Sigma=6\Omega \Bigg\} R_{1,\Sigma}=\frac{R_1\cdot R_\Sigma}{R_1-R_\Sigma}=2\Omega$$

$$\Sigma F=m\cdot\alpha \rightarrow w-F_L=m\cdot\alpha \rightarrow mg-BI\ell=m\alpha$$

$$\rightarrow mg-B\cdot\frac{\varepsilon_{\varepsilon\pi}}{R_{o\lambda}}\cdot\ell=m\alpha$$

$$\rightarrow mg-B\cdot\frac{B\upsilon\ell}{R_{1,\Sigma}+R_{K\Lambda}}\cdot\ell=m\alpha \ (*)$$

$$\rightarrow \alpha=g-\frac{B^2\ell^2\cdot\upsilon}{m\left(R_{1,\Sigma}+R_{K\Lambda}\right)}$$

$$\rightarrow \alpha=10-\frac{\upsilon}{0,3\cdot4} \rightarrow \alpha=10-\frac{5}{6}\upsilon \ (S.I.)$$

(*) Στον (ΚΛ): $\left|\varepsilon_{\varepsilon\pi}\right|=\left|\frac{\Delta\Phi}{\Delta t}\right|=\frac{B\ell\cdot\Delta x}{\Delta t}=B\upsilon\ell$

Συνεπώς $\upsilon\uparrow \rightarrow \alpha\downarrow$ μέχρι $\alpha=0 \rightarrow \Sigma F=0 \rightarrow \upsilon_{ορ\ (σταθερή)}$

α = 10 - $\alpha=10-\frac{5}{6}\cdot\upsilon \rightarrow 0=10-\frac{5}{6}\cdot\upsilon_{ορ} \rightarrow \upsilon_{ορ}=12m/s$

Γ3. $I=\frac{\varepsilon_{\varepsilon\pi}}{R_{o\lambda}}=\frac{B\upsilon\ell}{R_{1,\Sigma}+R_{K\Lambda}}=\frac{B\frac{\upsilon_{ορ}}{2}\cdot\ell}{R_{1,\Sigma}+R_{K\Lambda}}=\frac{6}{4}=1,5A$

$\Sigma F=w-F_L \rightarrow \Sigma F=mg-BI\ell$

$\rightarrow \Sigma F=3-1,5 \rightarrow \Sigma F=1,5N$

ή

$$\alpha=10-\frac{5}{6}\cdot\frac{\upsilon_{ορ}}{2}=10-\frac{5}{6}\cdot6=5m/s^2$$

$$\frac{\Delta P}{\Delta t}=\Sigma F=m\cdot\alpha=0,3\cdot5=1,5N$$

Γ4. $I=\frac{\varepsilon_{\varepsilon\pi}}{R_{o\lambda}}=\frac{B\upsilon_{o\rho}\ell}{R_{1,\Sigma}+R_{K\Lambda}}=\frac{12}{4}=3A$

$V_{MN}=I\cdot R_{1,\Sigma}=3-2=6V=V_K$

Λειτουργεί κανονικά.

ΘΕΜΑ Δ

$M_\rho=3kg$

$\ell=2m$

$m=1kg$

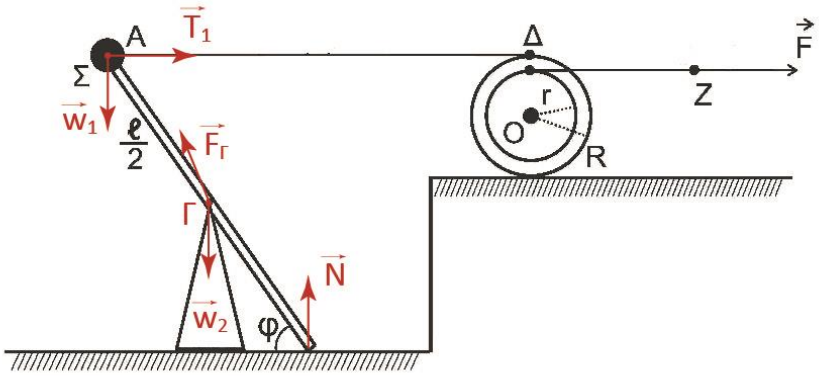
$\eta\mu\phi=0,8$

$\sigma\upsilon\nu\phi=0,6$

$M_T=7kg$

$R=0,4m$

$r=0,3m$



Δ1.

$T_1=10,5N$

$N=;$

$\Sigma\tau^{(\Gamma)}=0\rightarrow N\cdot\frac{\ell}{2}\sigma\upsilon\nu\phi+w_1\cdot\frac{\ell}{2}\sigma\upsilon\nu\phi-T_1\cdot\frac{\ell}{2}\eta\mu\phi=0$

$\rightarrow N\cdot 0,6+10\cdot 0,6-10,5\cdot 0,8=0$

$\rightarrow N+10-\frac{4}{3}10,5=0$

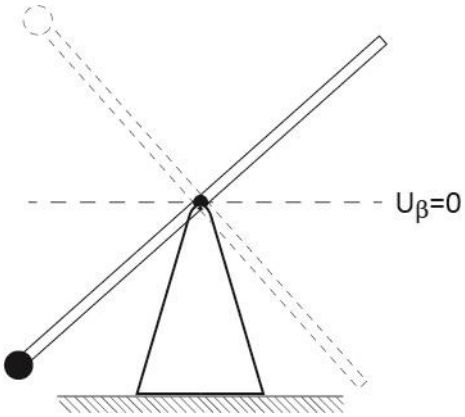
$\rightarrow N=14-10\rightarrow N=4N$

Δ2. $\Sigma\tau=I_{o\lambda}\cdot\alpha_{\gamma\omega\nu}\rightarrow w1\cdot\frac{\ell}{2}\sigma\upsilon\nu\phi=I_{o\lambda}\cdot\alpha_{\gamma\omega\nu}$

$\rightarrow \alpha_{\gamma\omega\nu}=3rad/s^2$

$\frac{dL}{dt}\rho=\Sigma\tau_\rho=I_\rho^{(\Gamma)}\cdot\alpha_{\gamma\omega\nu}=\frac{1}{12}M\rho\ell^2\cdot\alpha_{\gamma\omega\nu}=1\cdot 3=3kg\,m^2/s^2$

Δ3.



$$I_{o\lambda}=\frac{1}{12}M\rho\ell^2+m\left(\frac{\ell}{2}\right)^2=\frac{1}{12}\cdot 3\cdot 4+1\cdot 1^2=1+1=2\ kg\ m^2$$

ΑΔΜΕ $I\rightarrow II$ $\qquad k_I+U_I=k_{II}+U_{II}$

$$m_1g\frac{\ell}{2}\eta\mu\phi=\frac{1}{2}I_{o\lambda}\omega^2-m_1g\frac{\ell}{2}\eta\mu\phi$$

$$m_1g\,\ell\,\eta\mu\phi=\frac{1}{2}I_{o\lambda}\omega^2\rightarrow 16=\omega^2\rightarrow 4rad/s$$

$$L_{\alpha\rho\chi}=I_{o\lambda}\cdot\omega=2\cdot 4=8\ kg\ m^2/s$$

$$L_{\tau\varepsilon\lambda}=I_{o\lambda}\cdot\frac{\omega}{2}=2\cdot 2=4\ kg\ m^2/s$$

$\vec{L}_{\tau\varepsilon\lambda}$ $\vec{L}_{\alpha\rho\chi}$

$\odot$ $\otimes$

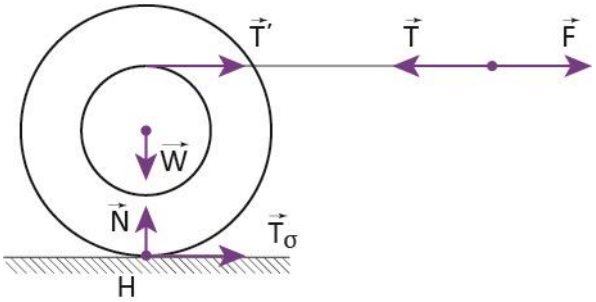
$\vec{\Delta L}\otimes$

$$\vec{\Delta L}=\vec{L}_{\tau\varepsilon\lambda}-\vec{L}_{\alpha\rho\chi}$$

$$\Delta L=L_{\tau\varepsilon\lambda}-\left(-L_{\alpha\rho\chi}\right)$$

$$\Delta L=L_{\tau\varepsilon\lambda}+L_{\alpha\rho\chi}=12\ kg\ m^2/s$$

Δ4.



$F = T = T' = 12N$

Στο σημείο Η

$\upsilon_H = \upsilon_{cm} - \upsilon_{γρ}$

$\upsilon_{cm} = \upsilon_{γρ} = \omega \cdot R \rightarrow \alpha_{cm} = \alpha_{γων} R$

$\Sigma F_x = M_T \cdot \alpha_{cm} \rightarrow T' + T\sigma = M_T \cdot \alpha_{cm}$

$\rightarrow F + T\sigma = M_T \cdot \alpha_{cm}$ (1)

$\Sigma\tau = I_{cm(T)} \cdot \alpha_{γων} \rightarrow T' \cdot r - T\sigma \cdot R = \frac{1}{2} M_T \cdot R^2 \cdot \frac{\alpha_{cm}}{R}$

$\rightarrow F \cdot \frac{3}{4} - T\sigma = \frac{1}{2} M_T \cdot \alpha_{cm}$ (2)

$\xrightarrow{(1)+(2)} F + \frac{3}{4}F = \frac{3}{4} M_T \cdot \alpha_{cm} \rightarrow 21 = \frac{3}{2} \cdot 7 \cdot \alpha_{cm} \rightarrow \alpha_{cm} = 2 m/s^2$

Δ5.

$\alpha_{γων} = \frac{\alpha_{cm}}{R} = \frac{2}{0,4} = 5 \, rad/s^2$

$\Delta x_{γων} = \frac{1}{2} \alpha_{cm} \cdot t^2 = \frac{1}{2} \cdot 2 \cdot 2^2 = 4m$

$\Delta\phi = \frac{1}{2} \alpha_{γων} t^2 = \frac{1}{2} \cdot 5 \cdot 2^2 = 10 rad$

$W_F = F \cdot \Delta x_{cm} + Z_F \cdot \Delta\phi$

$= F \cdot \Delta x_{cm} + F \cdot r \cdot \Delta\phi$

$= 12 \cdot 4 + 12 \cdot 0,3 \cdot 10$

$= 48 + 36$

$= 84 J$

ΚΑΛΑ ΑΠΟΤΕΛΕΣΜΑΤΑ!!!