Λύσεις Β λυκείου 17-04-2022

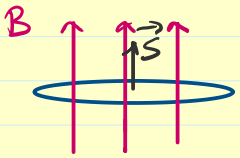
ΘΕΜΑ Α

Α1 γ **Α2** γ **Α3** δ **Α4** α

Α5 α) Σ β) Σ γ) Σ δ) Σ ε) Σ

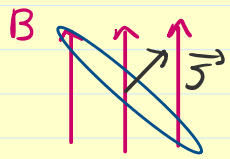
ΘΕΜΑ Β

Β1 Σωστή απάντηση: **β**



$$\Phi_{αρχ} = B \cdot S \cdot \sigma\upsilon 0^\circ = B \cdot S$$

⇝ Στρέφεται κατά 60°

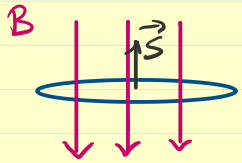


$$\Phi_{τελ} = B \cdot S \cdot \sigma\upsilon 60^\circ = \frac{B \cdot S}{2}$$

$$|\Delta\Phi| = |\Phi_{τελ} - \Phi_{αρχ}| = \left|\frac{B \cdot S}{2} - B \cdot S\right| = \frac{B \cdot S}{2}$$

$$\mathcal{E}_{επ_1} = N_1 \cdot \frac{|\Delta\Phi|}{\Delta t} \Rightarrow \mathcal{E}_{επ_1} = N_1 \cdot \frac{B \cdot S}{2\Delta t} \quad (1)$$

⇝ Αντιαρέφεται η μαγνητική επαγωγή



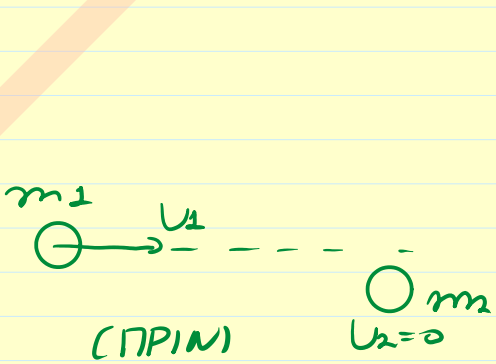
$$\Phi_{τελ} = B \cdot S \cdot \sigma\upsilon 180^\circ = -B \cdot S$$

$$|\Delta\Phi| = |\Phi_{τελ} - \Phi_{αρχ}| = |-B \cdot S - B \cdot S| = 2B \cdot S$$

$$\mathcal{E}_{επ_2} = N_2 \frac{|\Delta\Phi|}{\Delta t} \Rightarrow \mathcal{E}_{επ_2} = N_2 \frac{2B \cdot S}{\Delta t} \quad (2)$$

$$(1) = (2) \Rightarrow N_1 \cdot \frac{B \cdot S}{2\Delta t} = N_2 \cdot 2\frac{B \cdot S}{\Delta t} \Rightarrow \boxed{N_2 = \frac{N_1}{4}}$$

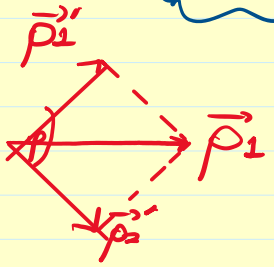
Β2 Σωστή απάντηση: **γ**



→ Σχέση Κ-ρ

$$K=\frac{1}{2}mv^2=\frac{1}{2}\cdot\frac{m\cdot m\cdot v^2}{m}=\frac{(mv)^2}{2m}=\frac{p^2}{2m}$$

→ Α.Δ.Ο. : $\vec{p}_1+\vec{p}_2=\vec{p}_1'+\vec{p}_2'$



$$p_1^2=p_1'^2+p_2'^2+2\cdot p_1'\cdot p_2'\cdot\sigma\upsilon\varphi \quad (1)$$

→ Α.Δ.Κ.Ε.

$$K_1+K_2=K_1'+K_2' \Rightarrow \frac{p_1^2}{2m_1}=\frac{p_1'^2}{2m_1}+\frac{p_2'^2}{2m_2}$$

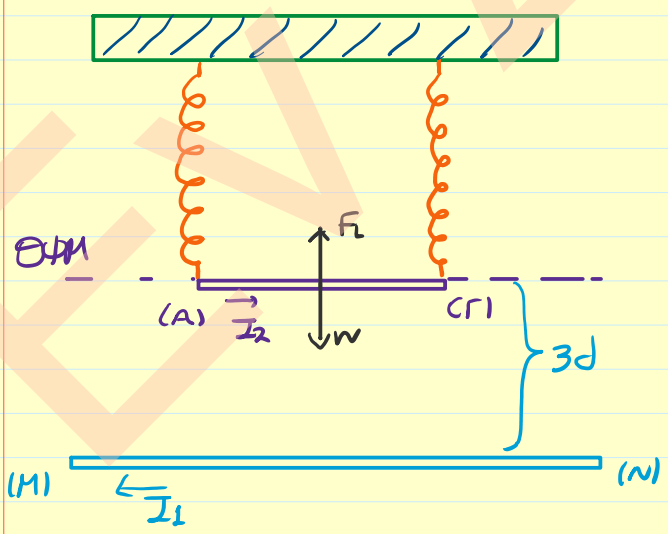
$$\Rightarrow p_1^2=p_1'^2+p_2'^2 \quad (2)$$

$$(1)\overset{(2)}{\Rightarrow} p_1'^2+p_2'^2=p_1'^2+p_2'^2+2\cdot p_1'\cdot p_2'\cdot\sigma\upsilon\varphi$$

$$\Rightarrow 2\cdot p_1'\cdot p_2'\cdot\sigma\upsilon\varphi=0 \quad \overset{2p_1'\cdot p_2'\neq 0}{\Rightarrow} \sigma\upsilon\varphi=0$$

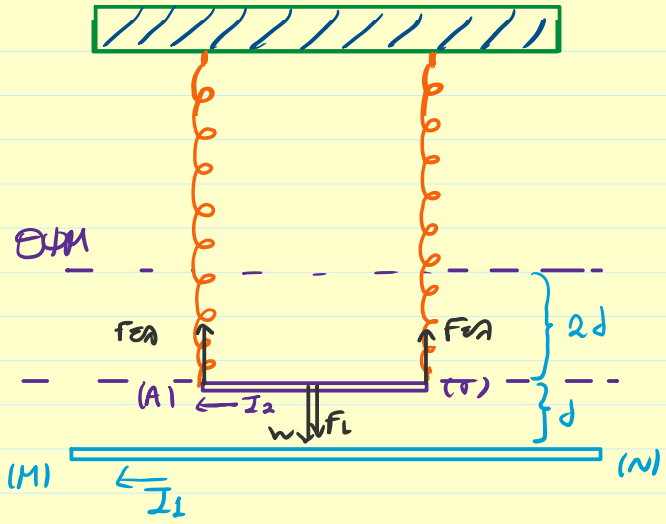
→ $\boxed{\varphi=90^\circ}$

B3 Σωστή απάντηση: α



$$\Sigma F=0 \Rightarrow k_\mu\frac{2I_1\cdot I_2\cdot\ell}{3d}=w$$

$$\Rightarrow k_\mu\frac{2I_1\cdot I_2\cdot\ell}{d}=3\cdot w \quad (1)$$



$\Sigma F=0 \Rightarrow F_L + w = F_{el} + F_{el}$

$\Rightarrow k_\mu \cdot \frac{2I_1 \cdot I_2}{d} \cdot \ell + w = 2 \cdot F_{el}$

(1) $\Rightarrow 3w + w = 2 \cdot k \cdot 2d$

$\Rightarrow 4w = 4k \cdot d$

$\Rightarrow \boxed{k = \frac{w}{d}}$

ΘΕΜΑ Γ

Γ1 $U_p = ;$, $t = 5s$

$\omega = \alpha_{\gamma\omega 1} \cdot t = 4 \cdot 5 \Rightarrow \omega = 20 rad/s$ $\longrightarrow U_p = \omega \cdot R \Rightarrow \boxed{U_p = 10 m/s}$

Γ2 $\alpha_{\gamma\omega 2} = ;$, $t_{stop} = ;$

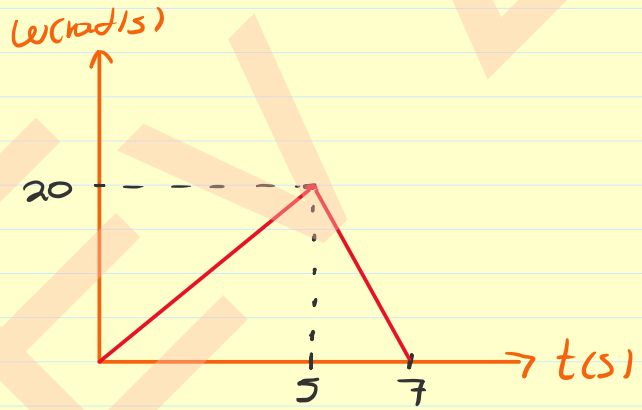
$N_2 = \frac{\Delta\theta_2}{2\pi} = \frac{10}{\pi} \Rightarrow \Delta\theta_2 = 20 rad$

$\Delta\theta_2 = \frac{\omega_0^2 - \omega^{2\to 0}}{2|\alpha_{\gamma\omega 1}|} \Rightarrow 20 = \frac{20^2}{2|\alpha_{\gamma\omega 1}|} \Rightarrow \boxed{|\alpha_{\gamma\omega 1}| = 10 rad/s^2}$

$\omega = \omega_0 - |\alpha_{\gamma\omega 1}| \cdot \Delta t \Rightarrow 0 = 20 - 10 \cdot \Delta t \Rightarrow \Delta t = 2s$

$\Delta t = t_{stop} - 5 \Rightarrow \boxed{t_{stop} = 7s}$

Γ3 $\omega - t$, $N = ;$



$\rightsquigarrow$ 0-5s: $\Delta\theta_1 = \frac{1}{2} \cdot \alpha_{\gamma\omega 1} \cdot t^2$

$\Rightarrow \Delta\theta_1 = \frac{1}{2} \cdot 4 \cdot 5^2 = 50 rad$

$N_1 = \frac{\Delta\theta_1}{2\pi} = \frac{50}{2\pi} \Rightarrow N_1 = \frac{25}{\pi} \text{στρ.}$

$\rightsquigarrow$ 5-7s: $N_2 = \frac{10}{\pi} \text{στρ.}$

$\boxed{N_{ολ} = N_1 + N_2 = \frac{35}{\pi} \text{στρ.}}$

Γ4 $S' = ;$

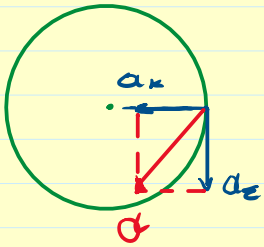
Από 3-4s:

$\Delta\theta = \frac{1}{2}\alpha_{\gamma\omega 2} t^2$ $\quad \begin{cases} t=3s \rightarrow \Delta\theta_3 = \frac{1}{2}\cdot 4\cdot 3^2 = 18\,rad \\ t=4s \rightarrow \Delta\theta_4 = \frac{1}{2}\cdot 4\cdot 4^2 = 32\,rad \end{cases}$

$\Delta\theta = \Delta\theta_4 - \Delta\theta_3 = 14\,rad$

$S = R\cdot\Delta\theta = 0,5\cdot 14 \Rightarrow \boxed{S = 7m}$

Γ5 $t = 0,5s$, $\alpha = ;$



$\omega = \alpha_{\gamma\omega 1}\cdot t = 4\cdot 0,5 = 2\,rad/s$

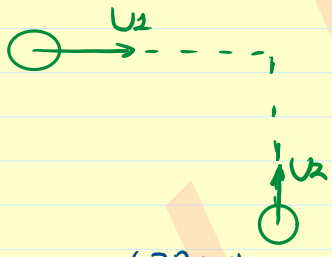
$a_K = \omega^2\cdot R = 2^2\cdot 0,5 \Rightarrow a_K = 2\,m/s^2$

$a_\varepsilon = \alpha_{\gamma\omega 2}\cdot R = 4\cdot 0,5 \Rightarrow a_\varepsilon = 2\,m/s^2$

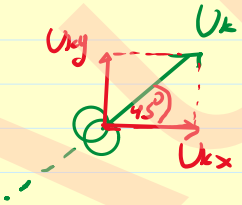
$\alpha = \sqrt{a_K^2 + a_\varepsilon^2} = \sqrt{2^2+2^2} \Rightarrow \boxed{\alpha = 2\sqrt{2}\,m/s^2}$

ΘΕΜΑ Δ

Δ1 α) $U_K = ;$, $U_2 = ;$



(ΠΡΙΝ)



(ΜΕΤΑ)

$U_{Kx} = U_K\cdot \sigma\upsilon\nu 45^\circ = U_K\cdot\frac{\sqrt{2}}{2}$

$U_{Ky} = U_K\cdot \eta\mu 45^\circ = U_K\cdot\frac{\sqrt{2}}{2}$

Α.Δ.Ο. $(x'x)$ $(\frac{C+1}{})$

$m_1\cdot U_1 = (m_1+m_2)\cdot U_{Kx} \Rightarrow 8 = 4\cdot U_K\frac{\sqrt{2}}{2} \Rightarrow U_K = \frac{4}{\sqrt{2}} = \frac{4\cdot\sqrt{2}}{2}$

$\Rightarrow \boxed{U_K = 2\sqrt{2}\,m/s}$

Α.Δ.Ο. $(y'y)$ $(\uparrow +)$

$m_2\cdot U_2 = (m_1+m_2)\cdot U_{Ky} \Rightarrow 2\cdot U_2 = 4\cdot U_K\frac{\sqrt{2}}{2} \Rightarrow 2\cdot U_2 = 4\cdot 2\sqrt{2}\cdot\frac{\sqrt{2}}{2}$

$\Rightarrow \boxed{U_2 = 4\,m/s}$

Δ2 π=;

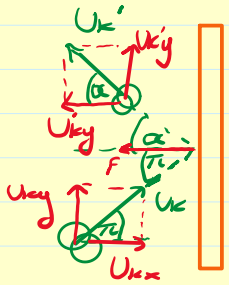
$K_{\text{αλ/τριν}} = \frac{1}{2} m_1 \cdot U_1^2 + \frac{1}{2} m_2 \cdot U_2^2 = \frac{1}{2} \cdot 2 \cdot 4^2 + \frac{1}{2} \cdot 2 \cdot 4^2 = 32\,J$

$K_{\text{αλ/μετ}} = \frac{1}{2} (m_1 + m_2) \cdot U_K^2 = \frac{1}{2} \cdot 4 \cdot (2\sqrt{2})^2 = 16\,J$

$Q_{\text{ΚΡ.}} = K_{\text{αλ/τριν}} - K_{\text{αλ/μετ}} = 16\,J$

$\pi = \frac{Q_{\text{ΚΡ}}}{K_{\text{αλ/τριν}}} \cdot 100\% = \frac{16}{32} \cdot 100\% \Rightarrow \boxed{\pi = 50\%}$

Δ3 Ν.Δ.Ο. : $\pi = \alpha$



Ελαστική:

$K_{\text{τριν}} = K_{\text{μετ}} \Rightarrow \frac{1}{2} m U_K^2 = \frac{1}{2} m U_K'^2$

$\Rightarrow U_K = U_K'$

Α.Δ.Ο. (y'y) : $m U_{Ky} = m U_{Ky}' \Rightarrow U_K \cdot \eta\mu\pi = U_K' \cdot \eta\mu\alpha$

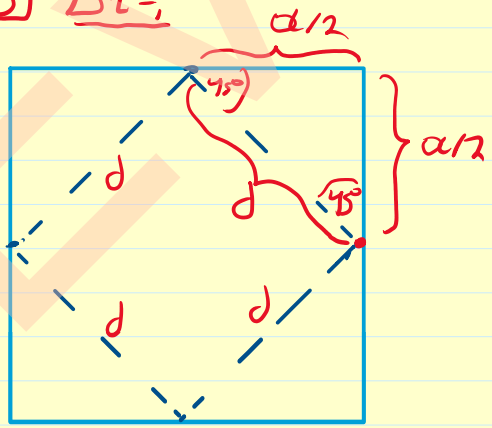
$\Rightarrow \boxed{\pi = \alpha}$

Δ4 F=;

$\Sigma \vec{F}_x = \frac{\Delta \vec{p}_x}{\Delta t} \overset{(+)}{\Rightarrow} F = \frac{m U_{Kx}' - (-m U_{Kx})}{\Delta t} = \frac{2 m U_K \cdot \sigma\upsilon\nu\alpha}{\Delta t}$

$\Rightarrow F = \frac{2 \cdot 4 \cdot 2\sqrt{2} \cdot \frac{\sqrt{2}}{2}}{0,02} \Rightarrow \boxed{F = 800\,N}$

Δ5 Δt=;



$d = \sqrt{\frac{\alpha^2}{4} + \frac{\alpha^2}{4}} = \frac{\alpha\sqrt{2}}{2} = 0,25\sqrt{2}\,m$

• Διανύει απόσταση $\Delta x = 4d$

$U_K = \frac{\Delta x}{\Delta t} \Rightarrow \Delta t = \frac{\Delta x}{U_K} = \frac{4d}{U_K}$

$\Rightarrow \Delta t = \frac{\sqrt{2}}{2\sqrt{2}} \Rightarrow \boxed{\Delta t = 0,5\,s}$