Λύσεις Β Λυκείου 23-03-2025

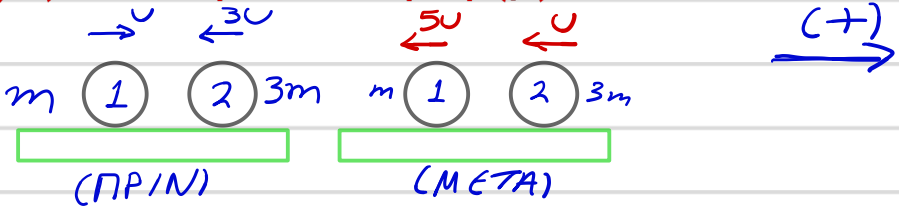
Θέμα Α

Α1) α Α2) γ Α3) β Α4)β

Α5) α) Σ β) Σ γ) Λ δ) Σ ε) Λ

Θέμα Β

Β1) i)Σωστή απάντηση:(β)



$\cdot U_1' = \frac{m_1-m_2}{m_1+m_2}(+U_1) + \frac{2m_2}{m_1+m_2}\cdot(-U_2) = \frac{-2m}{4m}(+U) + \frac{6m}{4m}(-3U)$

$\Rightarrow U_1' = -\frac{U}{2} - \frac{9}{2}U \Rightarrow \boxed{U_1' = -5U}$

$\cdot U_2' = \frac{2m_1}{m_1+m_2}\cdot(+U_1) + \frac{m_2-m_1}{m_1+m_2}(-U_2) = \frac{2m}{4m}\cdot(+U) + \frac{2m}{4m}(-3U)$

$\Rightarrow U_2' = \frac{U}{2} - \frac{3}{2}U \Rightarrow \boxed{U_2' = -U}$

ii)Σωστή απάντηση:(γ)

$\cdot K_1 = \frac{1}{2}mU^2$

$\cdot K_1' = \frac{1}{2}m(5U)^2 = 12{,}5mU^2$

$\Rightarrow \Delta K_1 = K_1' - K_1 = 12mU^2$

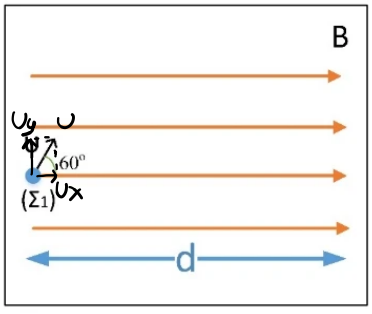
$\cdot K_2' = \frac{1}{2}3m\cdot(3U)^2 = 13{,}5mU^2$

$K_2 \longrightarrow \Delta K_1$

$100\% \longrightarrow \pi$

$\Rightarrow \pi = \frac{\Delta K_1}{K_2}\cdot 100\% = \frac{12mU^2}{13{,}5mU^2}\cdot 100\% \Rightarrow \boxed{\pi = \frac{800}{9}\%}$

Β2) Σωστή απάντηση:(α)

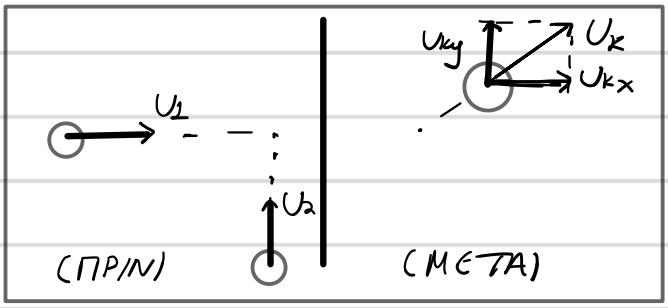


$U_x = U\cdot\sigma\upsilon\nu 60^\circ = \frac{U}{2}$ και $U_y = U\cdot\eta\mu 60^\circ = U\cdot\frac{\sqrt{3}}{2}$

Βήμα της έλικας: $\beta = U_x\cdot T = \frac{U}{2}\cdot\frac{2\pi m}{B\cdot|q|} = \frac{U\cdot\pi\cdot m}{B\cdot|q|}$

Αριθμός βημάτων: $N = \frac{d}{\beta} = \frac{10U\frac{\pi m}{B\cdot|q|}}{U\frac{\pi\cdot m}{B\cdot|q|}} \Rightarrow \boxed{N = 10\text{ βήματα}}$

Β3) Σωστή απάντηση:(β)



Α.Δ.Ο.(x'x)

$\vec{p}_{1x}+\vec{p}_{2x}=\vec{p}_{\kappa x} \overset{(+)}{\Rightarrow} 4m\cdot 2U=(m_1+m_2)\cdot U_{\kappa x}$

$\Rightarrow U_{\kappa x}=\frac{8mU}{10m} \Rightarrow U_{\kappa x}=0{,}8U$

Α.Δ.Ο.(y'y)

$\vec{p}_{1y}+\vec{p}_{2y}=\vec{p}_{\kappa y} \overset{(+)}{\Rightarrow} 6mU=(m_1+m_2)U_{\kappa y}$

$\Rightarrow U_{\kappa y}=\frac{6mU}{10m} \Rightarrow U_{\kappa y}=0{,}6U$

$\Rightarrow U_\kappa=\sqrt{U_{\kappa x}^2+U_{\kappa y}^2}=\sqrt{(0{,}8U)^2+(0{,}6U)^2}=\sqrt{0{,}64U^2+0{,}36U^2}=\sqrt{U^2}\Rightarrow U_\kappa=U$

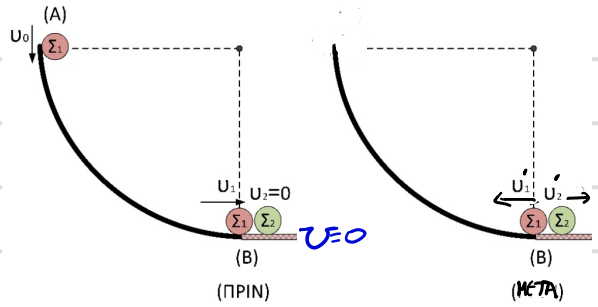
$K_{\text{αρχική}}=\frac{1}{2}4m\cdot(2U)^2+\frac{1}{2}6m\cdot U^2=11mU^2$

$K_{\text{τελική}}=\frac{1}{2}10m\cdot U^2=5mU^2$

$\Rightarrow \Delta K_{\Sigma\upsilon\sigma\tau.}=5mU^2-11mU^2 \Rightarrow \Delta K_{\Sigma\upsilon\sigma\tau.}=-6mU^2$

Θέμα Γ

Γ1)



Α.Δ.Μ.Ε.(Α→Β): $K_A+U_A=K_B+U_B$

$\Rightarrow \frac{1}{2}m_1U_0^2+m_1gR=\frac{1}{2}m_1U_1^2$

$\Rightarrow 2^2+20R=4^2 \Rightarrow 20R=16-4 \Rightarrow R=\frac{12}{20}$

$\Rightarrow R=0{,}6m$

Γ2)

$U_1'=\frac{m_1-m_2}{m_1+m_2}\cdot U_1=\frac{1-3}{1+3}\cdot 4 \Rightarrow U_1'=-2m/s$

$U_2'=\frac{2m_1}{m_1+m_2}\cdot U_1=\frac{2\cdot 1}{1+3}\cdot 4 \Rightarrow U_2'=2m/s$

Γ3)

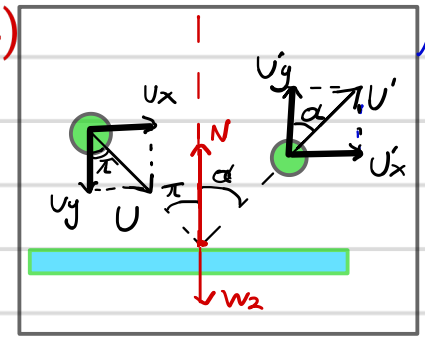
$K_1=\frac{1}{2}m_1U_1^2=\frac{1}{2}\cdot 1\cdot 4^2=8J$

$K_1'=\frac{1}{2}m_1U_1'^2=\frac{1}{2}\cdot 1\cdot 2^2=2J$

$\Rightarrow \Delta K_1=K_1'-K_1=-6J$

Άρα: $\pi_1=\frac{\Delta K_1}{K_1}\cdot 100\%=\frac{-6}{8}\cdot 100\% \Rightarrow \pi_1=-75\%$

Γ4)



Η κρούση είναι ελαστική:

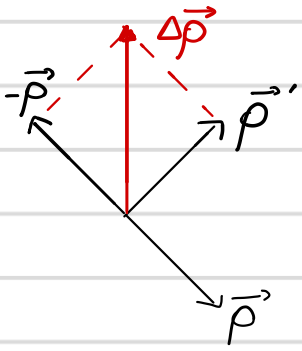
$K=K' \Rightarrow \frac{1}{2}m_2U^2=\frac{1}{2}m_2U'^2 \Rightarrow U=U'=4m/s$

Α.Δ.Ο.(x'x): $m_2U_x=m_2U'_x \Rightarrow U\cdot\eta\mu\pi=U'\cdot\eta\mu\alpha$

$\Rightarrow \eta\mu\pi=\eta\mu\alpha \rightarrow \hat{\pi}=\hat{\alpha}$

Γ5)

$\Delta\vec{p}=\vec{p}'-\vec{p}=\vec{p}'+(-\vec{p})$ με $p=m_2U=12kg\frac{m}{s}=p'$



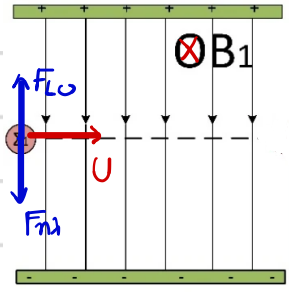
Μέτρο: $\Delta p = \sqrt{p^2+p'^2} = \sqrt{2p^2} = p\cdot\sqrt{2}$

$\Rightarrow \Delta p = 12\sqrt{2}\ kg\frac{m}{s}$

$\Sigma F = \frac{\Delta\vec{p}}{\Delta t} \overset{\uparrow(+)}{\Rightarrow} N - w_2 = \frac{\Delta p}{\Delta t} \Rightarrow N = 30 + \frac{12\sqrt{2}}{0,1\sqrt{2}}$

$\Rightarrow \boxed{N = 150N}$

Θέμα Δ

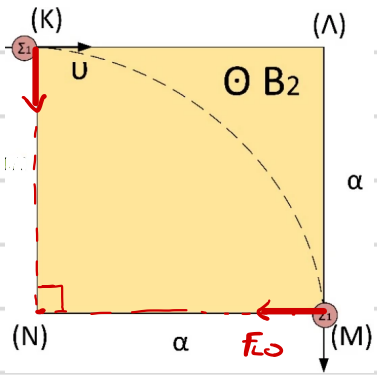
Δ1) 

Το σωματίδιο δέχεται την ηλεκτρική δύναμη που είναι ομόροπη της έντασης του ηλεκτρικού πεδίου και τη δύναμη Lorentz, η οποία πρέπει να είναι αντίρροπη.

U: σταθερή $\rightarrow \Sigma F = 0 \Rightarrow F_{L0} = F_{\Lambda\lambda} \Rightarrow B_1 U|q|\cdot\eta\mu 90^\circ = \epsilon|q|$

$\Rightarrow \epsilon = B_1\cdot U = 0,2\cdot 2\cdot 10^3 \Rightarrow \boxed{\epsilon = 400\ N/C}$

Από τον κανόνα των 3 δακτύλων του δεξιού χεριού: ⊗ B_1

Δ2) 

$W_{F_{L0}} = 0$ (αφού $\vec{F}_{L0} \perp \vec{U}$)

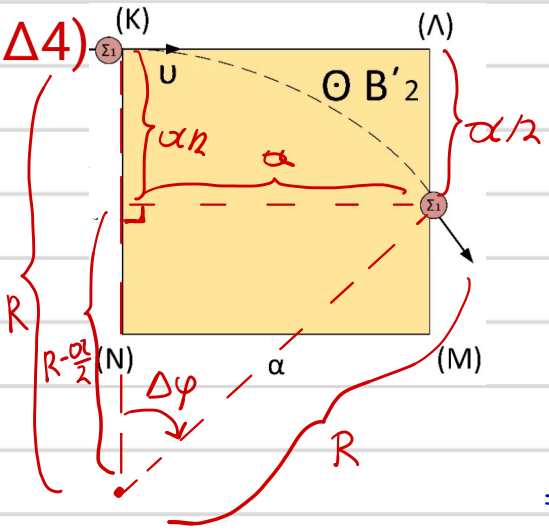
$\frac{\Delta p}{\Delta t} = F_{L0} = B_2 U|q| = 1\cdot 2\cdot 10^3\cdot 10^{-6} \Rightarrow \boxed{\frac{\Delta p}{\Delta t} = 2\cdot 10^{-3} N}$

Δ3) $R = \frac{m\cdot U}{B_2|q|} = \frac{10^{-10}\cdot 2\cdot 10^3}{1\cdot 10^{-6}} \Rightarrow \boxed{R = 0,2m = \alpha}$

Το σωματίδιο διαγράφει τεταρτοκύκλιο:

$T = \frac{2\pi m}{B_2|q|} \Rightarrow T = \frac{2\pi\cdot 10^{-10}}{1\cdot 10^{-6}} \Rightarrow T = 2\pi\cdot 10^{-4} s$

Άρα: $\boxed{\Delta t = \frac{T}{4} = \frac{\pi}{2}\cdot 10^{-4} s}$

Δ4) 

Π.Θ.: $R^2 = (R-\frac{\alpha}{2})^2 + \alpha^2$

$\Rightarrow R^2 = R^2 - 2\cdot R\cdot\frac{\alpha}{2} + \frac{\alpha^2}{4} + \alpha^2$

$\Rightarrow \frac{4}{4}\cdot R = \frac{5\alpha^2}{4} \Rightarrow \boxed{R = \frac{5\alpha}{4} = 0,25m}$

$R = \frac{m\cdot U}{B_2'|q|} \Rightarrow B_2' = \frac{m\cdot U}{R\cdot|q|} = \frac{10^{-10}\cdot 2\cdot 10^3}{0,25\cdot 10^{-6}}$

$\Rightarrow \boxed{B_2' = 0,8T}$

Δ5) $\eta\mu\Delta\varphi = \frac{\alpha}{R} = \frac{\alpha}{5\alpha/4} = \frac{4}{5} = 0,8 \rightsquigarrow \Delta\varphi = 53^\circ = 0,3\pi\ rad$

$$\left.\begin{array}{l} \Sigma\varepsilon \quad T \rightarrow 2\pi \text{ rad} \\ \Sigma\varepsilon \quad \Delta t \rightarrow 0{,}3\pi \text{ rad} \end{array}\right\} \Rightarrow \Delta t = \frac{0{,}3\pi}{2\pi} \cdot T = \frac{3}{20} \cdot T$$

$$\mu\varepsilon \quad T = \frac{2\pi m}{B \cdot |q|} = \frac{2\pi \cdot 10^{-10}}{0{,}8 \cdot 10^{-6}} = \frac{20}{8}\pi \cdot 10^{-4} s$$

$$\text{Άρα: } \Delta t = \frac{3}{20} \cdot \frac{20}{8}\pi \cdot 10^{-4} \Rightarrow \boxed{\Delta t = \frac{3\pi}{8} \cdot 10^{-4} s}$$