Φυσική Β λυκείου 16-10-2022

ΘΕΜΑ Α

Α1) Β Α2) α Α3) γ Α4) δ

Α5) α) Λ β) Σ γ) Σ δ) Σ ε) Σ

ΘΕΜΑ Β

Β1 Σωστή απάντηση η (γ)

Σώμα Σ1:

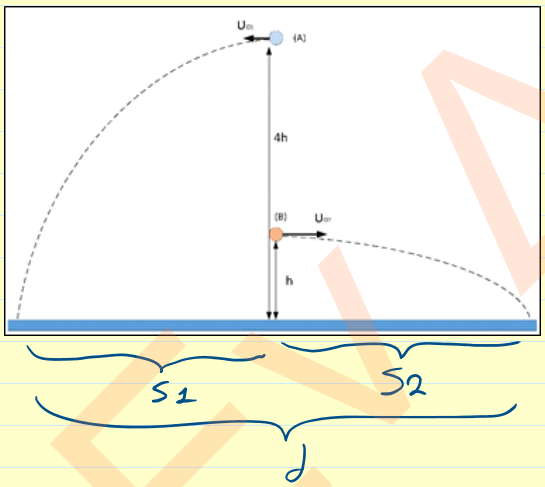
$$t_{ες1} = \sqrt{\frac{2h_1}{g}} = \sqrt{\frac{2\cdot 4h}{g}} = 2\cdot\sqrt{\frac{2h}{g}}$$

Βεληνεκές: $S_1 = U_{01}\cdot t_{ες1} \Rightarrow S_1 = 2\cdot U_{01}\cdot\sqrt{\frac{2h}{g}}$

Σώμα Σ2:

$$t_{ες2} = \sqrt{\frac{2\cdot h_2}{g}} = \sqrt{\frac{2\cdot h}{g}}$$

Βεληνεκές: $S_2 = U_{02}\cdot t_{ες2} \Rightarrow S_2 = 3\cdot U_{01}\cdot\sqrt{\frac{2h}{g}}$

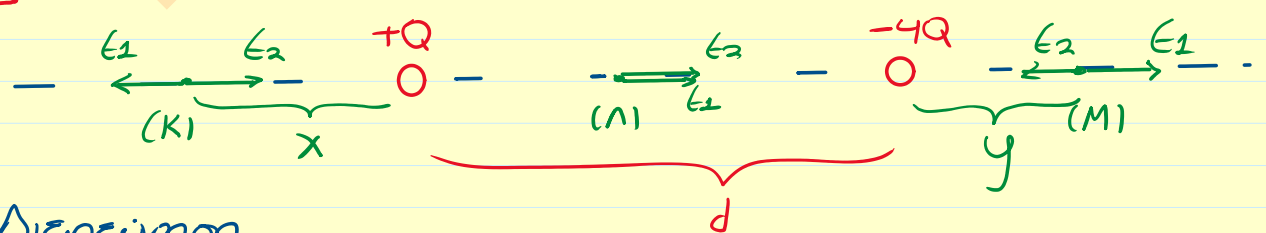


$$d = S_1 + S_2$$

$$\Rightarrow d = 2\cdot U_{01}\cdot\sqrt{\frac{2h}{g}} + 3U_{01}\cdot\sqrt{\frac{2h}{g}}$$

$$\Rightarrow \boxed{d = 5\cdot U_{01}\cdot\sqrt{\frac{2h}{g}}}$$

Β2 Σωστή απάντηση η (β)



Διερεύνηση

→ Σημείο Λ: $\vec{E}_1 \uparrow\downarrow \vec{E}_2$, οπότε $E_{ολ(Λ)} \neq 0$

→ Σημείο Μ:

$$\left.\begin{aligned} E_1 &= K_c \cdot \frac{|Q_1|}{(d+y)^2} \\ E_2 &= K_c \cdot \frac{|Q_2|}{y^2} \end{aligned}\right\} \xrightarrow{\substack{|Q_1|<|Q_2| \\ (d+y)^2 > y^2}} E_1 < E_2 \text{, άρα } E_{ολ(M)} \neq 0$$

→ Σημείο Κ:

$E_{ολ(K)} = 0 \Rightarrow E_1 = E_2 \Rightarrow \cancel{K_c} \cdot \frac{|Q_1|}{x^2} = \cancel{K_c} \cdot \frac{|Q_2|}{(d+x)^2}$

$\Rightarrow \frac{\cancel{Q}}{x^2} = \frac{4\cancel{Q}}{(d+x)^2} \Rightarrow \left(\frac{d+x}{x}\right)^2 = 4 \Rightarrow \frac{d+x}{x} = \pm 2$

- $\frac{d+x}{x} = 2 \Rightarrow d + x = 2x \Rightarrow \boxed{x = d}$
- $\frac{d+x}{x} = -2 \Rightarrow d + x = -2x \Rightarrow -3x = d \Rightarrow x = -\frac{d}{3}$ Απορ.

Β3 i) Χωρική απόσταση η (y)

$H = S \Rightarrow \frac{1}{2} g \cdot t^2 = U_0 \cdot t \Rightarrow t\left(\frac{g}{2} t - U_0\right) = 0$

→ $t = 0$

ή

→ $\frac{g \cdot t}{2} - U_0 = 0 \Rightarrow \boxed{t = \frac{2U_0}{g}}$

ii) Χωρική απόσταση η (β)

Όταν φτάνει στο έδαφος:

$H = \frac{1}{2} g \cdot t^2 = \frac{1}{2} g \left(\frac{2U_0}{g}\right)^2 = \frac{1}{2} \cdot \cancel{g} \cdot \frac{4U_0^2}{\cancel{g^2}} \Rightarrow H = \frac{2U_0^2}{g}$

Όταν η ταχύτητα είναι $U = 2U_0$:

- $U^2 = U_x^2 + U_y^2 \Rightarrow (2U_0)^2 = U_0^2 + U_y^2 \Rightarrow 4U_0^2 - U_0^2 = U_y^2$
  $\Rightarrow U_y = \sqrt{3} \cdot U_0$
- $U_y = g \cdot t_1 \Rightarrow \sqrt{3} \cdot U_0 = g \cdot t_1 \Rightarrow t_1 = \frac{\sqrt{3} \cdot U_0}{g}$

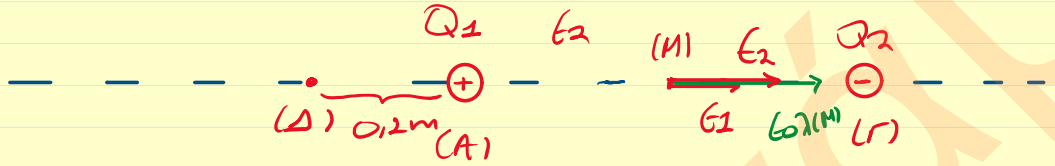
· $y_1 = \frac{1}{2} g t_1^2 = \frac{1}{2} g \left(\frac{\sqrt{3} \cdot U_0}{g}\right)^2 = \frac{1}{2} g \frac{3 U_0^2}{g^2} \Rightarrow y_1 = \frac{3}{2} \cdot \frac{U_0^2}{g}$

· Άρα, απ' το εδαφος:

$$h_1 = H - y_1 = \frac{2U_0^2}{g} - \frac{3}{2}\frac{U_0^2}{g} \Rightarrow \boxed{h_1 = \frac{U_0^2}{2g}}$$

ΘΕΜΑ Γ

Γ1 $E_{ολ(Μ)} = ;$



$$E_1 = K_c \cdot \frac{|Q_1|}{(AM)^2} = 9 \cdot 10^9 \cdot \frac{10 \cdot 10^{-6}}{(10^{-2})^2} = \frac{9 \cdot 10^4}{10^{-2}} \Rightarrow E_1 = 9 \cdot 10^6 N/C$$

$$E_2 = K_c \cdot \frac{|Q_2|}{(\Gamma M)^2} = 9 \cdot 10^9 \cdot \frac{2 \cdot 10 \cdot 10^{-6}}{(10^{-1})^2} = \frac{18 \cdot 10^4}{10^{-2}} \Rightarrow E_2 = 18 \cdot 10^6 N/C$$

$$E_{ολ(Μ)} = E_2 + E_1 \Rightarrow \boxed{E_{ολ(Μ)} = 27 \cdot 10^6 N/C}$$

Γ2 $V_M = ;$

~> Στο σημείο Μ:

$$V_1 = K_c \frac{Q_1}{(AM)} = 9 \cdot 10^9 \cdot \frac{10 \cdot 10^{-6}}{10^{-1}} \Rightarrow V_1 = 9 \cdot 10^5 V$$

$$V_2 = K_c \cdot \frac{Q_2}{(\Gamma M)} = 9 \cdot 10^9 \frac{(-2 \cdot 10 \cdot 10^{-6})}{10^{-1}} \Rightarrow V_2 = -18 \cdot 10^5 V$$

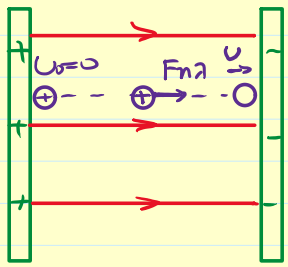
$$V_M = V_1 + V_2 \Rightarrow \boxed{V_M = -9 \cdot 10^5 V}$$

Γ3 $W_{Fηλ}^{Μ\to ω}$ =;

$$W_{Fηλ}^{Μ\to Δ} = q\cdot(V_M - V_\infty) = 2\cdot10^{-6}\,(-9\cdot10^{3} - 0)$$

$$\Rightarrow \boxed{W_{Fηλ}^{Μ\to Δ} = -1{,}8\,J}$$

Γ4 α =;



$$E = \frac{V}{\ell} = \frac{40}{8\cdot10^{-2}} \Rightarrow E = 500\ N/C$$

$$F_{ηλ} = E\cdot|q| = 500\cdot2\cdot10^{-6} \Rightarrow F_{ηλ} = 10^{-3}\,N$$

$$\alpha = \frac{F_{ηλ}}{m} = \frac{10^{-3}}{10^{-3}} \Rightarrow \boxed{\alpha = 1\ m/s^2}$$

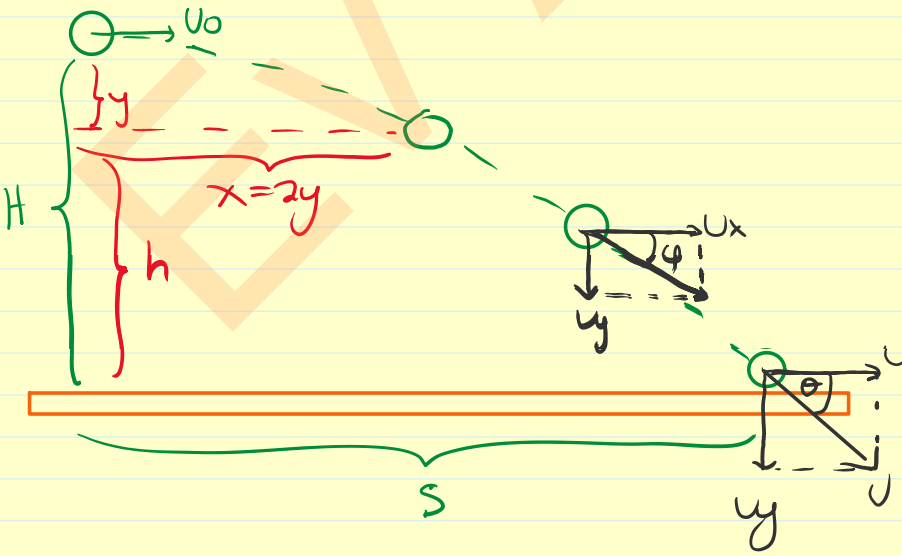
Γ5 t =; , υ =;

$$\ell = \frac{1}{2}\alpha t^2 \Rightarrow 8\cdot10^{-2} = \frac{1}{2}\cdot1\cdot t^2 \Rightarrow t = \sqrt{16\cdot10^{-2}} \Rightarrow \boxed{t = 0{,}4\,s}$$

$$\upsilon = \alpha\cdot t \Rightarrow \boxed{\upsilon = 0{,}4\ m/s}$$

ΘΕΜΑ Δ

Δ1) S =;



- $t_{εδ} = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2\cdot80}{10}}$

$\Rightarrow t_{εδ} = 4\,s$

- $S = \upsilon_0\cdot t_{εδ} \Rightarrow \boxed{S = 120\,m}$

$\rightsquigarrow (\upsilon = 0)$

Δ2 $U=;$

$$\left.\begin{array}{l} U_x = U_0 = 30\,m/s \\ U_y = g\cdot t_{\sigma\tau} = 40\,m/s \end{array}\right\} \Rightarrow U = \sqrt{U_x^2+U_y^2} \Rightarrow \boxed{U = 50\,m/s}$$

Δ3 $K=;$, $\varepsilon\varphi\cdot\varphi = \frac{1}{3}$

$$\varepsilon\varphi\cdot\varphi = \frac{1}{3} = \frac{U_y}{U_x} \Rightarrow U_y = \frac{U_x}{3} = \frac{30}{3} \Rightarrow U_y = 10\,m/s$$

$$K = \frac{1}{2}\cdot m\cdot U^2 = \frac{1}{2}\cdot m\cdot \left(\sqrt{U_x^2+U_y^2}\right)^2 = \frac{1}{2}2\cdot(30^2+10^2)$$

$$\Rightarrow \boxed{K = 1000\,J}$$

Δ4 $x = 6y$, $T=;$

$$x = 6y \Rightarrow U_0\cdot t = \frac{2}{2}\cdot g\cdot t^2 \Rightarrow 10t^2 - 30\cdot t = 0$$

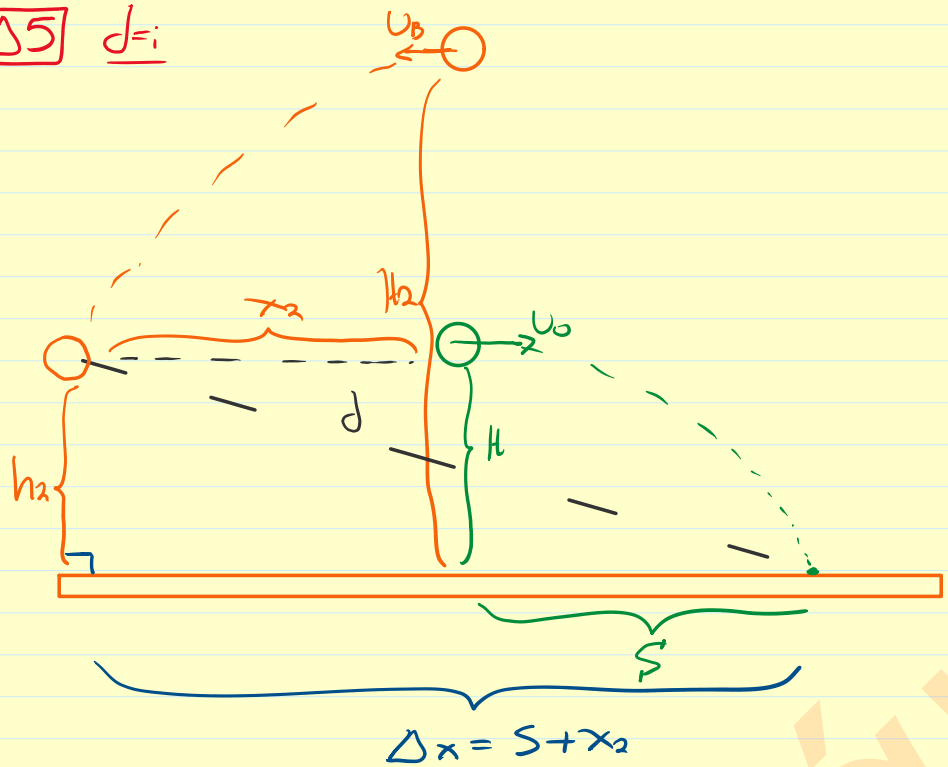
$$\Rightarrow 10t(t-3) = 0 \Rightarrow t = 0 \text{ ή } t = 3s$$

$$\rightsquigarrow y = \frac{1}{2}\cdot g\cdot t^2 \Rightarrow y = 45m$$

Από το σχήμα: $h = H - y \Rightarrow h = 35m$

$$T = m\cdot g\cdot h \Rightarrow \boxed{T = 700\,J}$$

Δ5 α=;



Όταν το σώμα Α φτάσει στο έδαφος, το σώμα Β, έχει διανύσει:

$x_2 = U_B \cdot t_{\pi\tau} = 10 \cdot 4 = 40m$

$y_2 = \frac{1}{2} \cdot g \cdot t_{\pi\tau}^2 = \frac{1}{2} \cdot 10 \cdot 4^2 = 80m$

$h_2 = H_2 - y_2 = 120m$

Με βάση το σχήμα:

$d = \sqrt{\Delta x^2 + h_2^2} = \sqrt{160^2 + 120^2} = \sqrt{25600 + 14400} = \sqrt{40.000}$

$\Rightarrow$ $\boxed{d = 200m}$