ΛΥΣΕΙΣ ΔΙΑΓΩΝΙΣΜΑΤΟΣ ΦΥΣΙΚΗΣ Α' ΛΥΚΕΙΟΥ 16/5/2021

ΘΕΜΑ Α

Α1) α Α2) γ Α3) α Α4) β

Α5) Λ, Λ, Λ, Σ, Λ

ΘΕΜΑ Β

Β1) $W^{A\to B} = -mgh$, $W^{B\to A} = +mgh$, $W^{A\to B\to A} = -mgh + mgh = 0$

Σωστό το (γ)

Β2) Ι) $W_F = E_{ΤΡΑΠ} = \frac{(6+2)4}{2}\,J = 16\,J$, **Σωστό το (α)**

ΙΙ) ΘΜΚΕ $\frac{1}{2}mυ^2 - 0 = W_F \Rightarrow υ = \sqrt{16} \Rightarrow υ = 4\,m/s$, **Σωστό το (γ)**

Β3) $U_A = mgh_A = 9.10.80 = 1600J$, $K_A = 0$, $E_A = K_A + U_A = 1600J$

$E_B = E_A = 1600J$, $U_B = mgh_B = 210.35 = 700J$, $K_B = E_B - U_B = 900J$

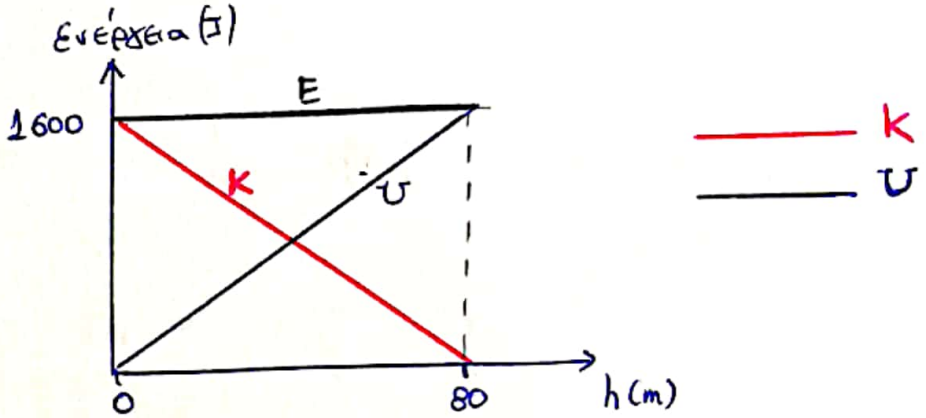
$K_B = \frac{1}{2}mυ_B^2 \Rightarrow υ_B = 30\,m/s$, $υ_B = gt_B \Rightarrow t_B = 3s$

$U_Γ = 0$, $E_Γ = E_A = 1600J$, $E_Γ = K_Γ = 1600J$

$K_Γ = \frac{1}{2}mυ_Γ^2 \Rightarrow υ_Γ = 40\,m/s$, $υ_Γ = gt_Γ \Rightarrow t_Γ = 4s$

ΘΕΣΗ	h (m)	K (J)	U (J)	υ (m/s)	t (s)
Α	80	0	1600	0	0
Β	35	900	700	30	3
Γ	0	1600	0	40	4

ΙΙ)



B4) • $\frac{1}{2}mv_1^2 - 0 = W_1$ (1)

• $\frac{1}{2}mv_2^2 - 0 = W_2 \Rightarrow \frac{1}{2}m(2v_1)^2 - 0 = W_2 \Rightarrow 4\frac{1}{2}mv_1^2 = W_2 \overset{(1)}{\Rightarrow}$

$\Rightarrow 4W_1 = W_2 \Rightarrow W_2 = 4W_1$ **Σωστό το (α)**

ΘΕΜΑ Γ

Γ1) **0–2s** Ε.Ο. ΕΠΙΤΑΧΥΝΟΜΕΝΗ Κ.

$\Delta x_1 = S_1 = E_1 = \frac{(8+4)2}{2}\,m = 12m$

$a_1 = \frac{\Delta U_1}{\Delta t_1} = 2 m/s^2$

2s–6s Ε.Ο.Κ.

$\Delta x_2 = S_2 = E_2 = 4 \cdot 8m = 32m$

$a_2 = 0$

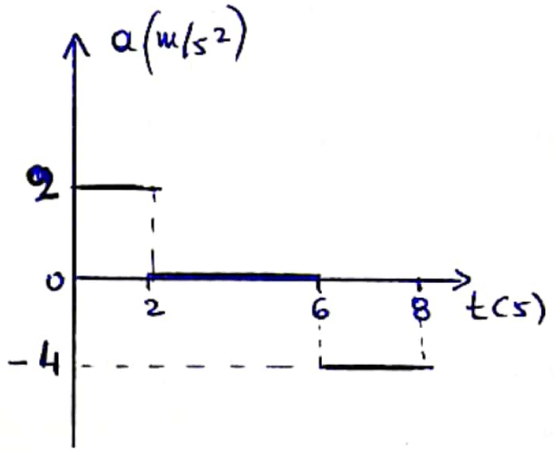
6s–8s Ε.Ο. ΕΠΙΒΡΑΔΥΝΟΜΕΝΗ Κ.

$\Delta x_3 = S_3 = E_3 = \frac{2 \cdot 8}{2}\,m = 8m$

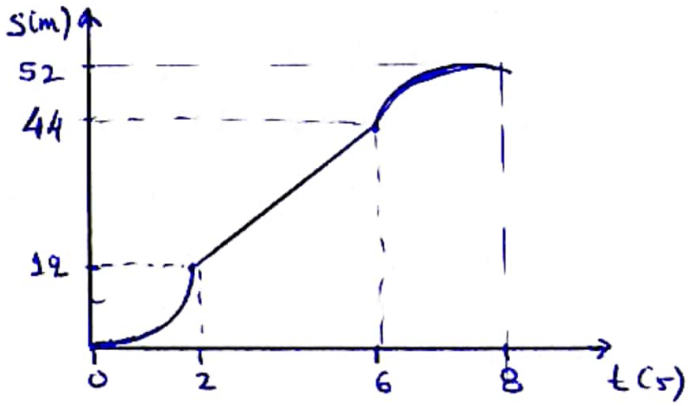
$a_3 = \frac{\Delta U_3}{\Delta t_3} = -4 m/s^2$

Β) $S_{ολ} = S_1 + S_2 + S_3 = 52m, \quad U_μ = \frac{S_{ολ}}{t_{ολ}} = \frac{52}{8} \Rightarrow \boxed{U_μ = 6{,}5 m/s}$

Γ2) **α)**



Β)



Γ3) $W_{T_{ολ}} = -T \cdot S_{ολ} = -10 \cdot 52\,J = -520J$

$Q_{ολ} = |W_{T_{ολ}}| = 520J$

Γ4) Για $t_1 = 1s$: $U_1 = U_0 + a_1 \Delta t_1 = 4 + 2 \cdot 1 \Rightarrow U_1 = 6 m/s$

Για $t_2 = 7s$: $U_2 = U_0 - |a_3| \cdot \Delta t_2 = 8 - 4 \cdot (7-6) \Rightarrow U_2 = 4 m/s$

$$\frac{K_1}{K_2} = \frac{\frac{1}{2} m U_1^2}{\frac{1}{2} m U_2^2} = \frac{6^2}{4^2} = \frac{36}{16} = \frac{9}{4}$$

ΘΕΜΑ Δ

Για το κεκλιμένο επίπεδο:

$W_1 = m_1 g = 100N$, $W_{1x} = W_1 \cdot \eta\mu\theta = 100 \cdot 0,6 = 60N$, $W_{1y} = W_1 \sigma\upsilon\nu\theta = 80N$

$\Sigma F_y = 0 \Rightarrow N = W_{1y} \Rightarrow N = 80N$, $T_1 = \mu \cdot N_1 = 0,5 \cdot 80 \Rightarrow T_1 = 40N$

Δ1) • $W_W = W_{W1x} = W_{1x} \cdot S \Rightarrow W_W = 60 \cdot 4\,J \Rightarrow \boxed{W_W = +240J}$

$\eta\mu\theta = \frac{h}{S} \Rightarrow S = \frac{h}{\eta\mu\theta} = \frac{2,4}{0,6} m \Rightarrow S = 4m$

• $W_{T_1} = -T_1 S = -40 \cdot 4\,J \Rightarrow \boxed{W_{T_1} = -160J}$

Δ2) ΘΜΚΕ $\frac{1}{2} m \upsilon_1^2 - 0 = W_{W1x} + W_{T_1} \Rightarrow \frac{1}{2} \cdot 10 \upsilon_1^2 = 240 - 160 \Rightarrow$

$5\upsilon_1^2 = 80 \Rightarrow \upsilon_1^2 = 16 \Rightarrow \upsilon_1 = \sqrt{16} \Rightarrow \boxed{\upsilon_1 = 4m/s}$

ή ΘΜΚΕ $K_1 - 0 = W_{W1x} + W_{T_1} \Rightarrow \boxed{K_1 = 80J}$

Για το οριζόντιο επίπεδο

ΣΩΜΑ m_1 $\Sigma F_y = 0 \Rightarrow N_1' = W_1 = 100N$, $T_1' = \mu \cdot N_1' = 50N$

$\Sigma F_x = m a_1 \Rightarrow T_1' = m a_1 \Rightarrow a_1 = 5 m/s^2$ (Μέτρο επιβράδυνσης)

Για $t_1 = 0,8s$: $S_1 = \upsilon_0 t_1 - \frac{1}{2} |a_1| \cdot t_1^2 \Rightarrow S_1 = 4 \cdot 0,8 - \frac{1}{2} \cdot 5 \cdot 0,8^2 \Rightarrow \boxed{S_1 = 1,6m}$

Όμως $t_1 = t_{stop} = \frac{\upsilon_0}{a_1} = 0,8s$ οπότε και $S_1 = S_{top} = 1,6m$.

ΣΩΜΑ m_2

$F_x = F \sigma\upsilon\nu\varphi = 50 \cdot 0,8 \Rightarrow F_x = 40N$, $F_y = F\eta\mu\varphi = 50 \cdot 0,6 \Rightarrow F_y = 30N$

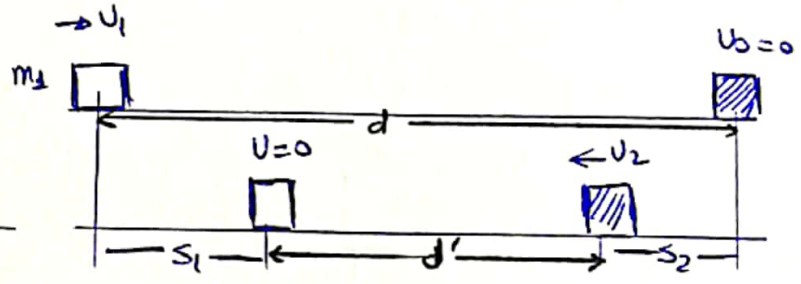
• $\Sigma F_y = 0 \Rightarrow N_2 + F_y = W_2 \Rightarrow N_2 = W_2 - F_y \Rightarrow N_2 = 50N - 30N \Rightarrow N_2 = 20N$

$T_2 = \mu \cdot N_2 = 0,5 \cdot 20N \Rightarrow T_2 = 10N$

• $\Sigma F_x = m_2 a_2 \Rightarrow F_x - T_2 = m_2 a_2 \Rightarrow 40 - 10 = 5 \cdot a_2 \Rightarrow a_2 = 6 m/s^2$

• Για $t_1 = 0,8s$: $S_2 = \frac{1}{2} a_2 t_1^2 = \frac{1}{2} \cdot 6 \cdot 0,8^2 \Rightarrow \boxed{S_2 = 1,92m}$

$\boxed{t_0 = 0}$

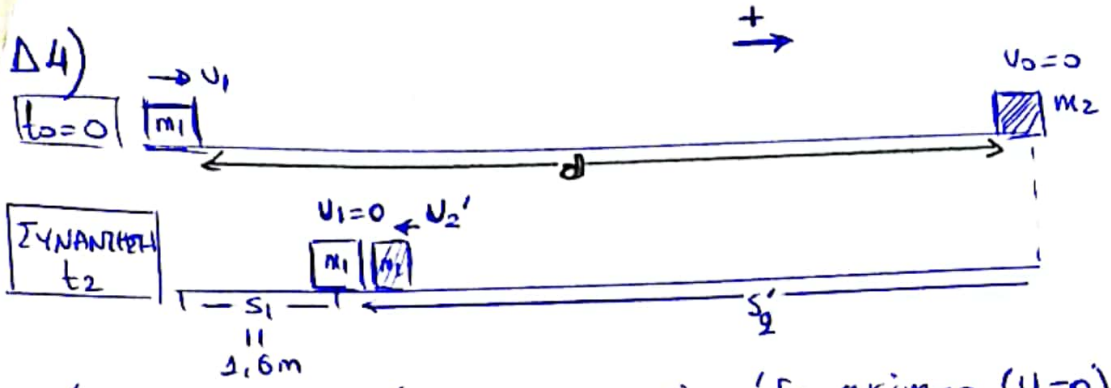


$\boxed{t_1 = 0,8s}$

Δ3)

$d' = d - S_1 - S_2 \Rightarrow d' = 49,6m - 1,6m - 1,92m \Rightarrow \boxed{d' = 46,08m}$

Δ4)



· Όταν γίνει η συνάντηση το m_1 είναι ήδη ακίνητο. ($u_1=0$)

· Το m_2 από τη $t_0=0$ ως τη στιγμή t_2 της συνάντησης έχει διανύσει διάστημα $s_2' = d - s_1 = 49,6m - 1,6m \Rightarrow s_2' = 48m$

· $s_2' = \frac{1}{2} a_2 t_2^2 \Rightarrow 48 = \frac{1}{2} \cdot 6 \cdot t_2^2 \Rightarrow t_2^2 = 16 \Rightarrow t_2 = \sqrt{16} \Rightarrow \boxed{t_2 = 4s}$

και $|u_2'| = a_2 t_2 = 6 \cdot 4\ m/s \Rightarrow |u_2'| = 24 m/s$ ή $u_2' = -24 m/s$ (αλγεβρική τιμή)

Δ5)