

ΛΥΣΕΙΣ ΔΙΑΓΩΝΙΣΜΑΤΟΣ ΦΥΣΙΚΗΣ Α΄ ΛΥΚΕΙΟΥ 5-12-2021

ΘΕΜΑ Α

A1) δ A2) δ A3) γ A4) β

A5) Λ, Σ, Λ, Λ, Σ

ΘΕΜΑ Β

B1.

$$x = 10t - 2t^2 \text{ (SI)}$$

$$x = v_0 t - \frac{1}{2} a t^2$$

Από σύγκριση: $v_0 = 10 \text{ m/s}$
 $2 = \frac{1}{2} a \Rightarrow a = 4 \text{ m/s}^2$

Άρα $v = v_0 - at \Rightarrow v = 10 - 4t \text{ (SI)}$ Σωστό το (α)

B2.

$$v = at \Rightarrow 4 = a \cdot 1 \Rightarrow a = 4 \text{ m/s}^2$$

$$\text{Για } t_1 = 1 \text{ s: } s_1 = \frac{1}{2} a t^2 = \frac{1}{2} \cdot 4 \cdot 1^2 \Rightarrow s_1 = 2 \text{ m}$$

$$\text{Για } t_2 = 2 \text{ s: } s_2 = \frac{1}{2} \cdot 4 \cdot 2^2 = 8 \text{ m και } v_2 = a \cdot t_2 \Rightarrow v_2 = 4 \cdot 2 \Rightarrow v_2 = 8 \text{ m/s}$$

$$v_3 = 16 \Rightarrow a t_3 = 16 \Rightarrow 4 t_3 = 16 \Rightarrow t_3 = 4 \text{ s και } s_3 = \frac{1}{2} \cdot 4 \cdot 4^2 = 32 \text{ m}$$

t (s)	v (m/s)	s (m)
0	0	0
1	4	2
2	8	8
4	16	32

B3.

A. Αποδείξεις βλέπε σελίδα 28 ΦΕΔ.

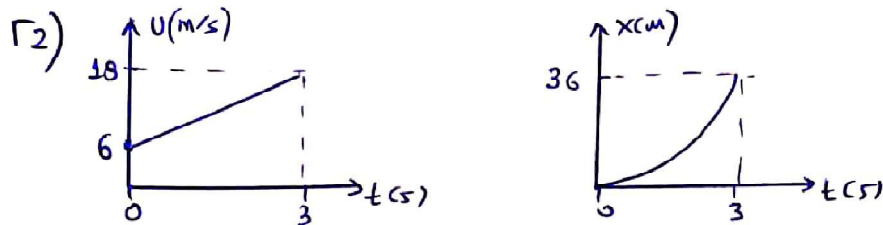
B. $d_1 = v_1^2 / 2a$ και $d_2 = v_2^2 / 2a$

Διαιρώντας κατά μέλη: $d_2 / d_1 = v_2^2 / v_1^2 = (2v_1)^2 / v_1^2 = 4$, άρα και $d_2 = 4 d_1$.

Σωστό το γ.

ΘΕΜΑ Γ

Γ1)
$$v_1 = v_0 + a t_1 \Rightarrow 18 = 6 + 4 \cdot t_1 \Rightarrow 12 = 4 t_1 \Rightarrow \boxed{t_1 = 3 \text{ s}}$$
$$x_1 = v_0 t_1 + \frac{1}{2} a t_1^2 \Rightarrow x_1 = 6 \cdot 3 + \frac{1}{2} \cdot 4 \cdot 3^2 \Rightarrow \boxed{x_1 = 36 \text{ m}}$$



Γ3)
$$v_2 = 5 v_0 = 5 \cdot 6 \frac{\text{m}}{\text{s}} \Rightarrow v_2 = 30 \frac{\text{m}}{\text{s}}$$
$$s = \frac{v_2^2 - v_1^2}{2a} = \frac{30^2 - 18^2}{2 \cdot 4} = \frac{900 - 324}{8} \Rightarrow \boxed{s = 72 \text{ m}}$$

$$\overset{\text{h}}{=} s_1 = v_0 t_1 + \frac{1}{2} a t_1^2 \Rightarrow s_1 = 36 \text{ m}$$

$$t_2 = \frac{v_2 - v_0}{a} = \frac{30 - 6}{4} \Rightarrow t_2 = 6 \text{ s} \quad \text{καί} \quad s_2 = v_0 t_2 + \frac{1}{2} a t_2^2 \Rightarrow s_2 = 108 \text{ m}$$

Άρα
$$s = s_2 - s_1 = 108 \text{ m} - 36 \text{ m} \Rightarrow s = 72 \text{ m}$$

Γ4) • Στην διάρκεια των 3ων sec:

$$\Delta s_3 = s_3 - s_2 = v_0 t_3 + \frac{1}{2} a' t_3^2 - (v_0 t_2 + \frac{1}{2} a' t_2^2) \Rightarrow$$
$$\Delta s_3 = 6 \cdot 3 + \frac{1}{2} a' \cdot 3^2 - (6 \cdot 2 + \frac{1}{2} a' \cdot 2^2) \Rightarrow$$
$$\Delta s_3 = 18 + \frac{9}{2} a' - 12 - \frac{4}{2} a' \Rightarrow \Delta s_3 = 6 + \frac{5}{2} a' \quad (1)$$

• Στην διάρκεια των 2ων sec:

$$\Delta s_2 = v_0 t_2 + \frac{1}{2} a' t_2^2 - (v_0 t_1 + \frac{1}{2} a' t_1^2) \Rightarrow$$
$$\Delta s_2 = 6 \cdot 2 + \frac{1}{2} a' \cdot 2^2 - (6 \cdot 1 + \frac{1}{2} a' \cdot 1^2) \Rightarrow$$
$$\Delta s_2 = 12 + \frac{4}{2} a' - 6 - \frac{1}{2} a' \Rightarrow \Delta s_2 = 6 + \frac{3}{2} a' \quad (2)$$

•
$$\Delta s_3 - \Delta s_2 = 6 \quad \begin{matrix} (1) \\ (2) \end{matrix} \Rightarrow 6 + \frac{5}{2} a' - (6 + \frac{3}{2} a') = 6 \Rightarrow$$

$$\Rightarrow \frac{5}{2} a' - \frac{3}{2} a' = 6 \Rightarrow \frac{2}{2} a' = 6 \Rightarrow \boxed{a' = 6 \text{ m/s}^2}$$

ΘΕΜΑ Δ

Δ1.

α) $0-2s$ $E \rightarrow K$, $\Delta x_1 = E_1 = 40m$, $s_1 = |\Delta x_1| = 40m$, $a_1 = 0$
 $2s-4s$ $E \rightarrow 0$. Επιταχ. K , $\Delta x_2 = E_2 = \frac{(40+20) \cdot 2}{2} = 60m$, $s_2 = |\Delta x_2| = 60m$
 $a_2 = \frac{40-20}{4-2} m/s^2 \Rightarrow a_2 = 10 m/s^2$
 $4s-8s$ $E \rightarrow 0$ Επιβραδ. K , $\Delta x_3 = E_3 = \frac{40 \cdot 4}{2} = 80m$, $s_3 = |\Delta x_3| = 80m$
 $a_3 = \frac{0-40}{8-4} m/s^2 \Rightarrow a_3 = -10 m/s^2$
 $8s-10s$ $E \rightarrow 0$. Επιταχισμένη K (με ΑΝΤΙΘΕΤΗ φορά).
 $\Delta x_4 = E_4 = \frac{2 \cdot (-20)}{2} \Rightarrow \Delta x_4 = -20m$, $s_4 = |\Delta x_4| = 20m$
 $a_4 = \frac{-20-0}{10-8} \Rightarrow a_4 = -10 m/s^2$

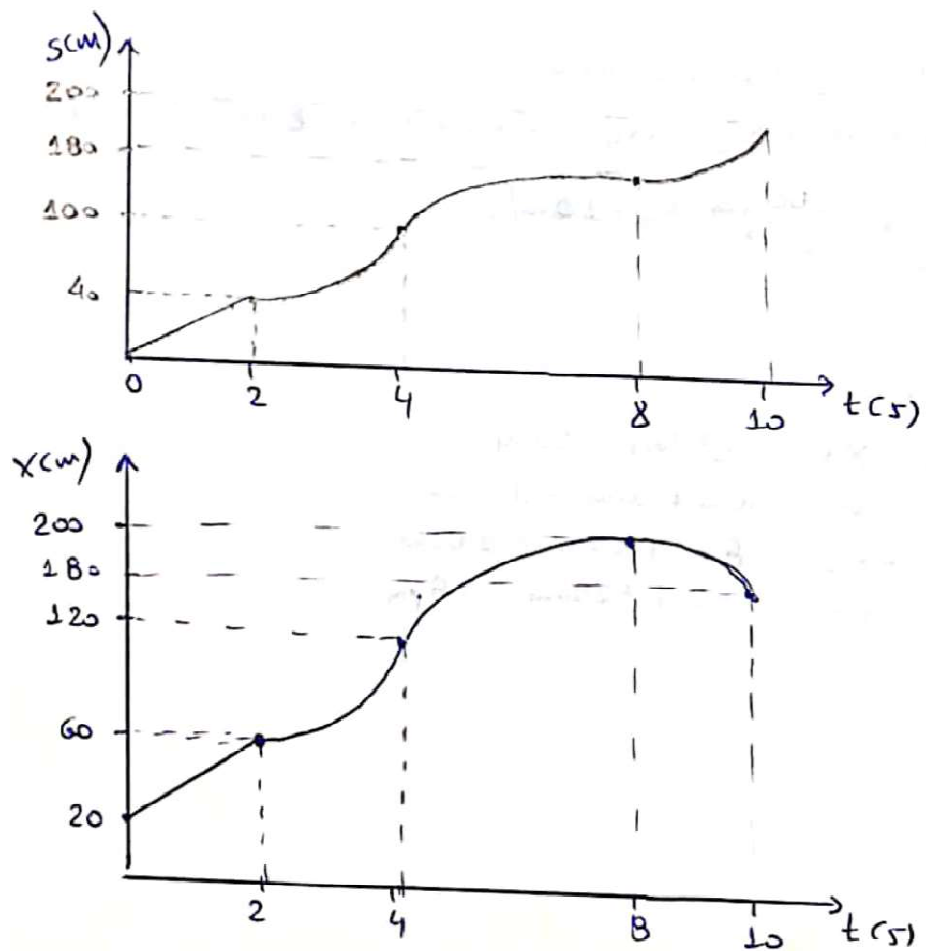
β) $S_{ολ} = s_1 + s_2 + s_3 + s_4 = 200m$
 $\Delta x_{ολ} = \Delta x_1 + \Delta x_2 + \Delta x_3 + \Delta x_4 = 40m + 60m + 80m + (-20m) = 160m$
 γ) $v_{μ} = \frac{S_{ολ}}{t_{ολ}} = \frac{200m}{10s} \Rightarrow v_{μ} = 20 m/s$

Δ2.

$x_0 = 20m$
 $x_1 = \Delta x_1 + x_0 = 40m + 20m = 60m$
 $x_2 = \Delta x_2 + x_1 = 60m + 60m = 120m$
 $x_3 = \Delta x_3 + x_2 = 80m + 120m = 200m$
 $x_4 = \Delta x_4 + x_3 = -20m + 200m = 180m$

Χρονικό διάστημα	$t_{αρχ}$	$x_{αρχ}$	$t_{τελ}$	$x_{τελ}$	a (m/s^2)
0-2s	0s	20m	2s	60m	0
2s-4s	2s	60m	4s	120m	10
4s-8s	4s	120m	8s	200m	-10
8s-10s	8s	200m	10s	180m	-10

Δ3.



Δ4.

Για $t_1=5s$: $v_1 = v_{αρχ} - |\alpha_3| \Delta t = 40 - 10(5-4) = 30 \text{ m/s}$

Για $t_2=9s$: $v_4 = \alpha_4 \Delta t = -10(9-8) = -10 \text{ m/s}$