

Θέμα Α

A1 -β, A2 -γ, A3 -γ, A4 -δ, A5 - 1) Λ 2) Σ 3) Σ 4) Λ 5) Σ

Θέμα Β

B1.

α) Σωστό

$$\alpha_A = \frac{\Delta v}{\Delta t} \Rightarrow \alpha_A = \frac{6-2}{2-0} \Rightarrow \boxed{\alpha_A = 2 \text{ m/s}^2}$$

$$\alpha_B = \frac{\Delta v}{\Delta t} \Rightarrow \alpha_B = \frac{6-0}{2-0} \Rightarrow \boxed{\alpha_B = 3 \text{ m/s}^2}$$

β) Λάθος

$$v_A = v_0 + \alpha_A \cdot t \Rightarrow v_A = 2 + 2 \cdot 3 \Rightarrow \boxed{v_A = 8 \text{ m/s}}$$

$$v_B = \alpha_B \cdot t \Rightarrow v_B = 3 \cdot 3 \Rightarrow \boxed{v_B = 9 \text{ m/s}}$$

γ) Λάθος

$$x_A = v_0 \cdot t + \frac{1}{2} \cdot \alpha_A \cdot t^2 \Rightarrow x_A = 2 \cdot 4 + \frac{1}{2} \cdot 2 \cdot 4^2 \Rightarrow x_A = 8 + 16 \Rightarrow \boxed{x_A = 24 \text{ m}}$$

$$x_B = \frac{1}{2} \cdot \alpha_B \cdot t^2 \Rightarrow x_B = \frac{1}{2} \cdot 3 \cdot 4^2 \Rightarrow \boxed{x_B = 24 \text{ m}}$$

$$\text{Άρα: } \boxed{\Delta x = x_B - x_A = 0}$$

B2.

1) Σωστή απάντηση είναι η (α).

Από την εξίσωση ταχύτητας-χρόνου:

$$v = v_0 - |\alpha| \cdot t \xrightarrow{v=0} 0 = v_0 - |\alpha| \cdot t_{\text{stop}} \Rightarrow |\alpha| \cdot t_{\text{stop}} = v_0 \Rightarrow \boxed{t_{\text{stop}} = \frac{v_0}{|\alpha|}}$$

Από την εξίσωση κίνησης του σώματος:

$$x = v_0 \cdot t - \frac{1}{2} \cdot |\alpha| \cdot t^2 \xrightarrow{t=t_{\text{stop}} = \frac{v_0}{|\alpha|}} x = v_0 \cdot \frac{v_0}{|\alpha|} - \frac{1}{2} \cdot |\alpha| \cdot \left(\frac{v_0}{|\alpha|}\right)^2 \Rightarrow x = \frac{v_0^2}{|\alpha|} - \frac{v_0^2}{2|\alpha|} \Rightarrow \boxed{x = \frac{v_0^2}{2|\alpha|}}$$

2) Σωστή απάντηση είναι η (γ).

Από τη σχέση που αποδείξαμε στο B2-1), έχουμε:

$$d_1 = \frac{v_1^2}{2|\alpha|} \quad (1)$$

$$d_2 = \frac{v_2^2}{2|\alpha|} \Rightarrow d_2 = \frac{(2 \cdot v_1)^2}{2|\alpha|} \Rightarrow d_2 = \frac{4 \cdot v_1^2}{2|\alpha|} \quad (2)$$

Με διαίρεση κατά μέλη των δύο σχέσεων, έχουμε:

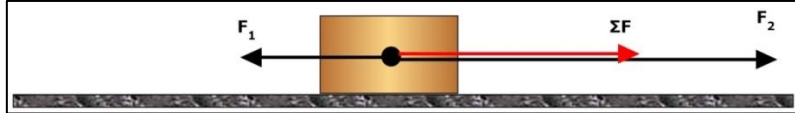
$$\frac{(2)}{(1)} \Rightarrow \frac{d_2}{d_1} = \frac{\frac{4 \cdot v_1^2}{2|\alpha|}}{\frac{v_1^2}{2|\alpha|}} \Rightarrow \frac{d_2}{d_1} = \frac{4 \cdot v_1^2 \cdot 2|\alpha|}{v_1^2 \cdot 2|\alpha|} \Rightarrow \frac{d_2}{d_1} = 4 \Rightarrow \boxed{d_2 = 4d_1}$$

Β3. Σωστή απάντηση είναι η (iii).

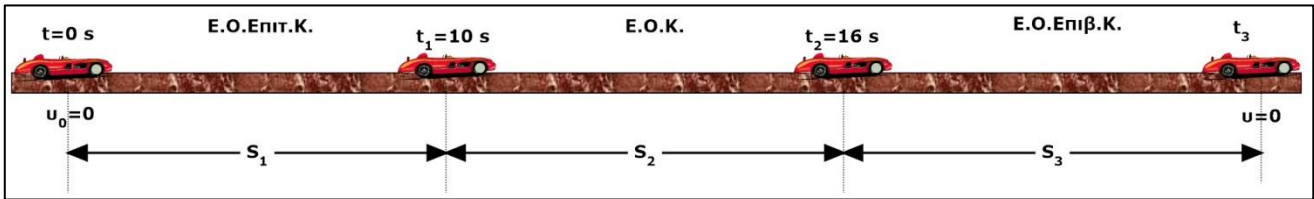
Αφού οι δυνάμεις είναι αντίρροπες, ισχύει:

$$F_2 - F_1 = \Sigma F \xrightarrow{F_2=3F_1} 3F_1 - F_1 = 8 \Rightarrow 2F_1 = 8 \Rightarrow F_1 = 4 \text{ N}$$

$$F_2 = 3F_1 \Rightarrow F_2 = 12 \text{ N}$$



Θέμα Γ

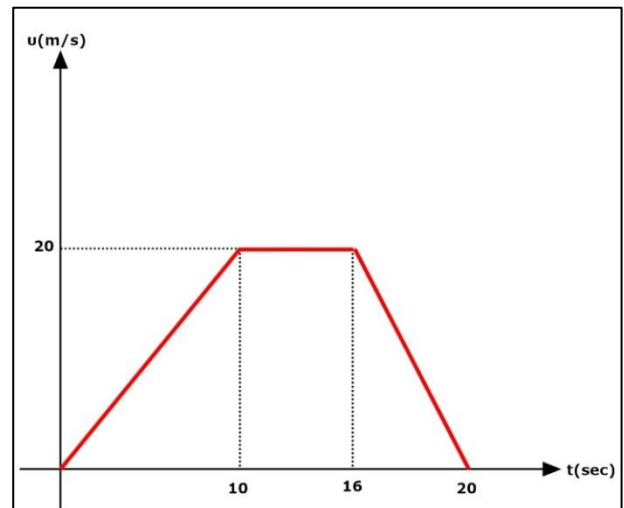
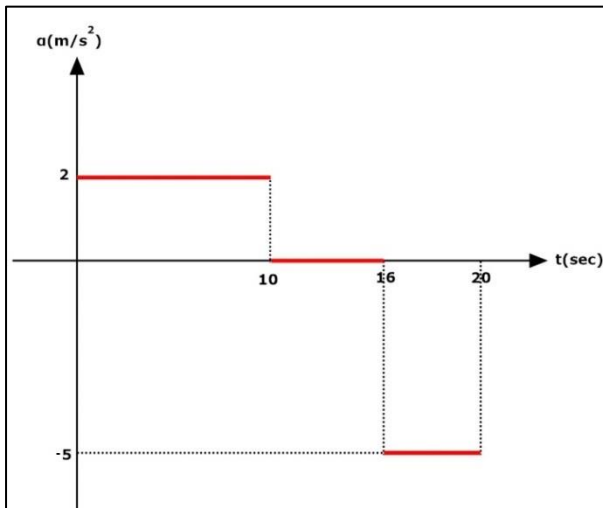


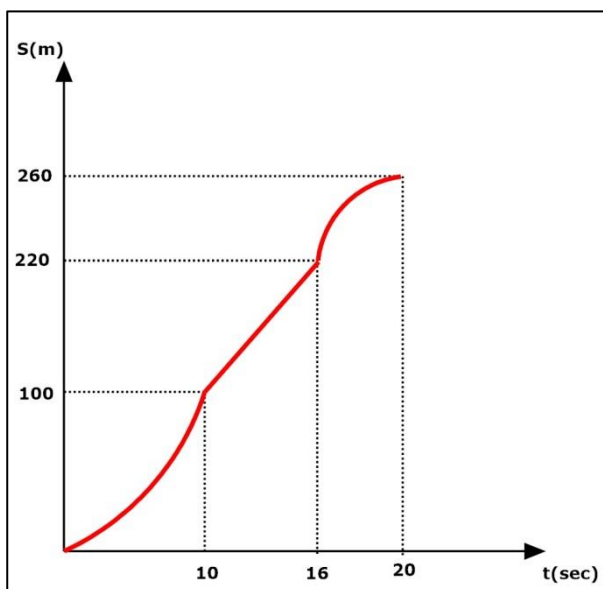
$a_1 = 2 \text{ m/s}^2, \Delta t_1 = 10 \text{ sec}$	$a_2 = 0 \text{ m/s}^2, \Delta t_2 = 6 \text{ sec}$	$\Delta t_3 = 4 \text{ sec}$
$v_1 = a_1 \cdot \Delta t_1 \Rightarrow v_1 = 2 \cdot 10$ $\Rightarrow v_1 = 20 \text{ m/s}$	$v_2 = v_1 = 20 \text{ m/s}$	$v = v_0 - \alpha_3 \cdot \Delta t_3 \Rightarrow 0 = 20 - \alpha_3 \cdot 4$ $\Rightarrow \alpha_3 = \frac{20}{4} \Rightarrow \alpha_3 = 5 \text{ m/s}^2$
$S_1 = \frac{1}{2} \cdot a_1 \cdot \Delta t_1^2$ $\Rightarrow S_1 = \frac{1}{2} \cdot 2 \cdot 10^2$ $\Rightarrow S_1 = 100 \text{ m}$	$S_2 = v_2 \cdot \Delta t_2$ $\Rightarrow S_2 = 20 \cdot 6$ $\Rightarrow S_2 = 120 \text{ m}$	$S_3 = \frac{v_0^2}{2 \cdot \alpha_3 } \Rightarrow S_3 = \frac{20^2}{2 \cdot 5} \Rightarrow S_3 = 40 \text{ m}$

Γ1. $v = v_0 - |\alpha_3| \cdot \Delta t_3 \Rightarrow 0 = 20 - |\alpha_3| \cdot 4 \Rightarrow |\alpha_3| = \frac{20}{4} \Rightarrow |\alpha_3| = 5 \text{ m/s}^2$

Γ2. $S_{\text{ολ.}} = S_1 + S_2 + S_3 \Rightarrow S_{\text{ολ.}} = 100 + 120 + 40 \Rightarrow S_{\text{ολ.}} = 260 \text{ m}$

Γ3.





Γ4. Υπολογίζουμε τη μετατόπιση του σώματος από 0-4 sec και από 0-5 sec.

$$\Delta x_1 = \frac{1}{2} \cdot a_1 \cdot \Delta t^2 \Rightarrow \Delta x_1 = \frac{1}{2} \cdot 2 \cdot 4^2 \Rightarrow \Delta x_1 = 60 - 22,5 \Rightarrow \Delta x_1 = 16m$$

$$\Delta x_2 = \frac{1}{2} \cdot a_1 \cdot \Delta t^2 \Rightarrow \Delta x_2 = \frac{1}{2} \cdot 2 \cdot 5^2 \Rightarrow \Delta x_2 = 25m$$

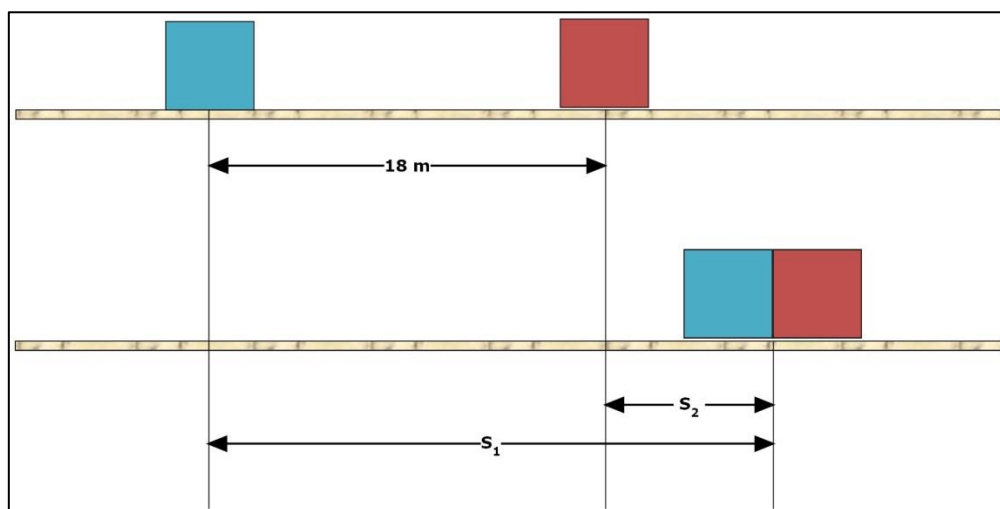
$$\Delta x = \Delta x_2 - \Delta x_1 \Rightarrow \Delta x = 25 - 16 \Rightarrow \boxed{\Delta x = 9m}$$

Γ5. Την $t=7$ sec: $v_7 = a_1 \cdot \Delta t_1 \Rightarrow v_7 = 2 \cdot 7 \Rightarrow \boxed{v_7 = 14m/s}$

Την $t=19$ sec: $v_{19} = v_0 - |a_3| \cdot \Delta t_3 \Rightarrow v_{19} = 20 - 5 \cdot (19 - 16) \Rightarrow v_{19} = 20 - 15 \Rightarrow \boxed{v_{19} = 5m/s}$

Θέμα Δ

Δ1.



$$s_1 - s_2 = 18 \Rightarrow \frac{1}{2} \alpha_1 t^2 - \frac{1}{2} \alpha_2 t^2 = 18 \Rightarrow \frac{1}{2} 3t^2 - \frac{1}{2} 2t^2 = 18 \Rightarrow \frac{1}{2} t^2 = 18 \Rightarrow t^2 = 36 \Rightarrow \boxed{t = 6 \text{ sec}}$$

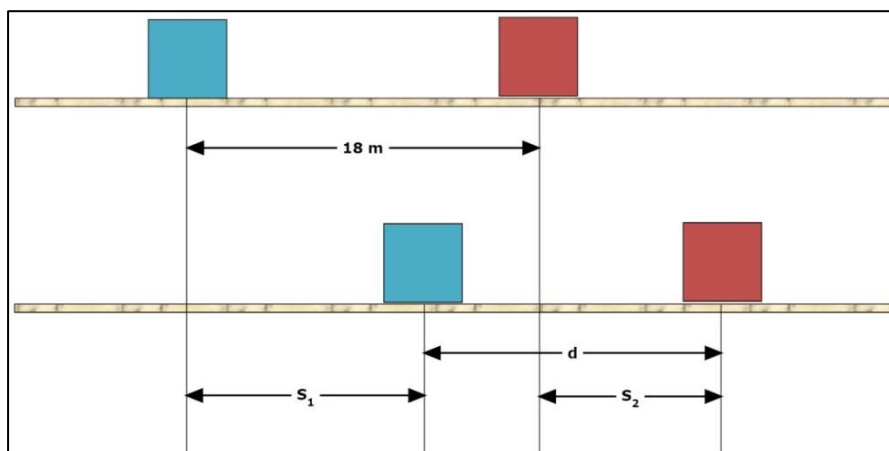
Δ2. $v_1 = \alpha_1 \cdot t \Rightarrow v_1 = 3 \cdot 6 \Rightarrow \boxed{v_1 = 18m/s}$

$v_2 = \alpha_2 \cdot t \Rightarrow v_2 = 2 \cdot 6 \Rightarrow \boxed{v_2 = 12m/s}$

$$S_1 = \frac{1}{2} \alpha_1 t^2 \Rightarrow S_1 = \frac{1}{2} \cdot 3 \cdot 6^2 \Rightarrow S_1 = 54 \text{ m}$$

$$S_2 = \frac{1}{2} \alpha_2 t^2 \Rightarrow S_2 = \frac{1}{2} \cdot 2 \cdot 6^2 \Rightarrow S_2 = 36 \text{ m}$$

Δ3.



$$S_1 = \frac{1}{2} \alpha_1 t^2 \Rightarrow S_1 = \frac{1}{2} \cdot 3 \cdot 3^2 \Rightarrow S_1 = 13,5 \text{ m}$$

$$S_2 = \frac{1}{2} \alpha_2 t^2 \Rightarrow S_2 = \frac{1}{2} \cdot 2 \cdot 3^2 \Rightarrow S_2 = 9 \text{ m}$$

$$d + S_1 = 18 + S_2 \Rightarrow d = 18 - S_1 + S_2 \Rightarrow d = 18 - 13,5 + 9 \Rightarrow d = 18 - 4,5 \Rightarrow \boxed{d = 13,5 \text{ m}}$$

Δ4. Το σώμα Β εκτελεί Ε.Ο.Κ. στη συνέχεια. Μετατοπίζεται 24 m σε χρονικό διάστημα:

$$v_B = \frac{\Delta x}{\Delta t} \Rightarrow \Delta t = \frac{24}{12} \Rightarrow \Delta t = 2 \text{ sec}$$

Η ταχύτητα του σώματος Α είναι:

$$v_A = v_1 + a_1 \cdot \Delta t \Rightarrow v_A = 18 + 3 \cdot 2 \Rightarrow \boxed{v_A = 24 \text{ m/s}}$$

Δ5.

