ΛΥΣΕΙΣ ΔΙΑΓΩΝΙΣΜΑΤΟΣ ΦΥΣΙΚΗΣ Α΄ ΛΥΚΕΙΟΥ 20-2-2022

ΘΕΜΑ Α

Α1. γ Α2. δ Α3.β Α4.α Α5. Σ,Σ,Λ,Σ,Σ

ΘΕΜΑ Β

Β1) $F-mg=ma \Rightarrow F-mg=m\cdot 3g \Rightarrow F=3mg+mg \Rightarrow F=4mg \Rightarrow$
$F=4w \Rightarrow \boxed{w=\frac{F}{4}}$, Σωστό το (Β)

Β2) $t_B=\sqrt{\frac{2h_B}{g}}=\sqrt{\frac{2h}{g}}=\sqrt{2}\sqrt{\frac{h}{g}}$

$t_A=\sqrt{\frac{2h_A}{g}}=\sqrt{\frac{2\frac{h}{2}}{g}}=\sqrt{\frac{h}{g}}$

$\frac{t_B}{t_A}=\sqrt{2} \Rightarrow \boxed{t_B=\sqrt{2}t_A}$, Σωστό το (γ)

Β3) $\left.\begin{array}{l} s_1=\frac{d}{4} \\ s_2=\frac{3d}{4} \end{array}\right\} \overset{(:)}{\Rightarrow} \frac{s_1}{s_2}=\frac{\frac{d}{4}}{\frac{3d}{4}} \Rightarrow \frac{s_1}{s_2}=\frac{1}{3} \Rightarrow s_2=3s_1 \Rightarrow \frac{1}{2}a_2t^2=3\frac{1}{2}a_1t^2 \Rightarrow$

$\Rightarrow a_2=3a_1 \Rightarrow \frac{F_2}{m}=3\frac{F_1}{m} \Rightarrow \boxed{F_2=3F_1}$, Σωστό το (γ)

Β4) $\underline{0-2s}$ $a_1=\frac{F_1}{m}=\frac{10}{1}=10m/s^2$

$a_1=\frac{v_1-v_0}{t_1-t_0} \Rightarrow 10=\frac{v_1-0}{2-0} \Rightarrow v_1=20m/s$

$\underline{2s-4s}$ $a_2=\frac{F_2}{m}=0$, αρα $v_2=v_1=20m/s$

$\underline{4s-10s}$ $a_3=\frac{F_3}{m}=-\frac{5}{1}=-5m/s^2$

$a_3=\frac{v_3-v_2}{t_3-t_2} \Rightarrow -5=\frac{v_3-20}{10-4} \Rightarrow -5=\frac{v_3-20}{6} \Rightarrow -30=v_3-20 \Rightarrow$

$\Rightarrow \boxed{v_3=-10m/s}$, Σωστό το (γ)

ΘΕΜΑ Γ

Γ1) $t_{\epsilon\delta}=\sqrt{\frac{2H}{g}}=3s$, $U_{\epsilon\delta}=g\,t_{\epsilon\delta}=30m/s$

Γ2) $y_1=\frac{1}{2}g t_1^2=\frac{1}{2}10\cdot 1^2=5m$, $y_2=\frac{1}{2}g t_2^2=\frac{1}{2}\cdot 10\cdot 2^2 \Rightarrow y_2=20m$

$\boxed{\Delta y=y_2-y_1=15m}$

Γ3) $U=gt \Rightarrow 20=10t \Rightarrow t=2s$

$y=\frac{1}{2}gt^2=\frac{1}{2}\cdot 10\cdot 2^2 \Rightarrow y=20m$

$h=H-y=45m-20m \Rightarrow \boxed{h=25m}$

Γ4) $t=t_{\epsilon\delta}-1s=2s$

$y=U_0 t+\frac{1}{2}gt^2 \Rightarrow 45=U_0\cdot 2+\frac{1}{2}\cdot 10\cdot 2^2 \Rightarrow \boxed{U_0=12,5m/s}$

Γ5) $\Sigma F=ma \Rightarrow W-F_{\alpha\epsilon\rho\alpha}=ma \Rightarrow 20-10=2\cdot a \Rightarrow a=5m/s^2$

$H_2=\frac{1}{2}at^2 \Rightarrow t=\sqrt{\frac{2H_2}{a}}=\sqrt{\frac{2\cdot 40}{5}} \Rightarrow \boxed{t=4s}$

$U=at \Rightarrow U=5\cdot 4 \Rightarrow \boxed{U=20m/s}$

ΘΕΜΑ Δ

1η κίνηση (0-5s) $F_1 = m a_1 \Rightarrow 10 = 5 a_1 \Rightarrow a_1 = 2 m/s^2$

$S_1 = U_0 \Delta t_1 - \frac{1}{2}|a_1|\Delta t_1^2 = 20 \cdot 5 - \frac{1}{2} \cdot 2 \cdot 5^2 = 100 - 25 \Rightarrow S_1 = 75m$

$U_1 = U_0 - |a_1| \Delta t_1 = 20 - 2 \cdot 5 \Rightarrow U_1 = 10 m/s$, $\Delta t_1 = t_1 - t_0 \Rightarrow \Delta t_1 = t_1 = 5s$

2η κίνηση (5s-10s) $\Sigma F = 0 \rightarrow$ Ευθ. $\rightarrow U_2 = U_1 = 10 m/s$

$S_2 = U_2 \Delta t_2 = 10 \cdot 5 \Rightarrow S_2 = 50m$

$\Delta t_2 = t_2 - t_1 \Rightarrow t_2 = \Delta t_2 + t_1 = 10s$

3η κίνηση (10s → μέχρι ακινητοποίησης σώματος)

$\Sigma F = m a_3 \Rightarrow F_1 + F_3 - F_2 = m a_3 \Rightarrow 20 = 5 a_3 \Rightarrow a_3 = 4 \frac{m}{s^2}$ (μέτρο)

$\Delta t_3 = t_{stop} = \frac{U_0}{|a_3|} = \frac{U_2}{|a_3|} = \frac{10}{4} \Rightarrow \Delta t_3 = 2,5 sec$

$S_3 = S_{stop} = \frac{U_0^2}{2|a_3|} = \frac{10^2}{2 \cdot 4} \Rightarrow S_3 = 12,5m$

$\boxed{U_1 = 10 m/s}$

$\Delta t_3 = t_3 - t_2 \Rightarrow t_3 = \Delta t_3 + t_2 = 2,5s + 10s \Rightarrow t_3 = 12,5s$

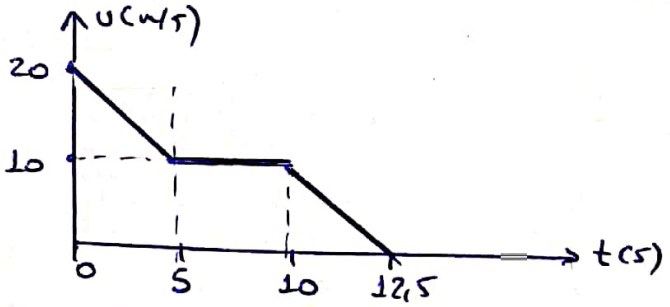
$S_{123} = S_1 + S_2 + S_3 = 75m + 50m + 12,5m \Rightarrow \boxed{S_{123} = 137,5m}$

$x_0 = -5m$

$x_1 = \Delta x_1 + x_0 = 75m + (-5m) \Rightarrow x_1 = 70m$

$x_2 = \Delta x_2 + x_1 = 50m + (+70m) \Rightarrow x_2 = +120m$

$x_3 = \Delta x_3 + x_2 = 12,5m + 120m \Rightarrow \boxed{x_3 = 132,5m}$



Δ4) Το σώμα επιταχύνεται, μετά την $t_3 = 12,5s$, προς την αντίθετη κατεύθυνση με επιτάχυνση μέτρου $a_3 = 4 m/s^2$. Από $t_3 = 12,5 sec$ μέχρι t_4 που θα έχει $|U| = 20 m/s$, ισχύει: $|U| = a_3 \Delta t_4 \Rightarrow 20 = 4 \cdot \Delta t_4 \Rightarrow \Delta t_4 = 5s$

και $S_4 = \frac{1}{2} a_3 \Delta t_4^2 = \frac{1}{2} \cdot 4 \cdot 5^2 \Rightarrow S_4 = 50m$

Οπότε $\Delta t_4 = t_4 - t_3 \Rightarrow 5s = t_4 - 12,5s \Rightarrow \boxed{t_4 = 17,5s}$

Δ5) $x_4 = \Delta x_4 + x_3 = (-50m) + 132,5m \Rightarrow \boxed{x_4 = 82,5m}$