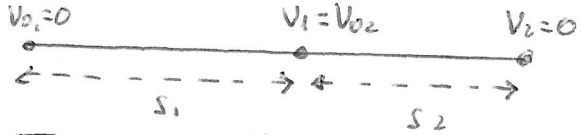


EJERCICIOS CINEMÁTICA (II)

- 11) $v_{01} = 0 \text{ m/s}$
 $a_1 = +3 \text{ m/s}^2$
 $t_1 = 20 \text{ s}$
 $a_2 = \text{cte}$
 $v_2 = 0 \text{ m/s}$
 $t_2 = 12 \text{ s}$
 a) s_1 ? v_1 ?
 b) a_2 ? s_2 ?
 c) v_m ?



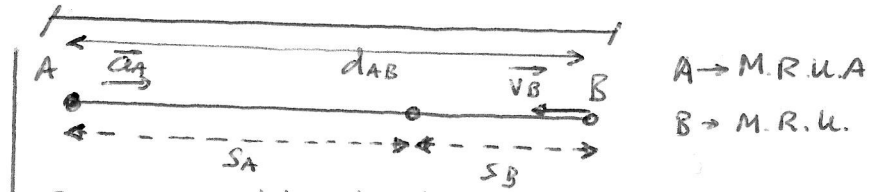
a) $s_1 = s_{01} + v_{01}t_1 + \frac{1}{2}a_1t_1^2 = \frac{1}{2}3 \text{ m/s}^2 (20 \text{ s})^2 = 600 \text{ m}$
 $v_1 = v_{01} + a_1 \cdot t_1 = 3 \text{ m/s}^2 \cdot 20 \text{ s} = 60 \text{ m/s}$

b) $v_{02} = v_1 = 60 \text{ m/s}$; $v_2 = v_{02} + a_2 \cdot t_2$; $a_2 = \frac{v_2 - v_{02}}{t_2} = \frac{0 \text{ m/s} - 60 \text{ m/s}}{12 \text{ s}} = -5 \text{ m/s}^2$
 $v_2^2 - v_{02}^2 = 2a_2 \cdot s_2 \Rightarrow s_2 = \frac{v_2^2 - v_{02}^2}{2a_2} = \frac{0 - (60 \text{ m/s})^2}{2 \cdot (-5 \text{ m/s}^2)} = 360 \text{ m}$

c) $v_m = \frac{s_T}{t_T} = \frac{600 \text{ m} + 360 \text{ m}}{20 \text{ s} + 12 \text{ s}} = \frac{960 \text{ m}}{32 \text{ s}} = 30 \text{ m/s}$

1º) $s = s_0 + v_0 t + \frac{1}{2} a t^2$
 2º) $v = v_0 + a \cdot t$
 3º) $v^2 - v_0^2 = 2 a s$ ($s_0 = 0$)

- 12) $d_{A-B} = 10.000 \text{ m}$
 $a_A = 1,2 \text{ m/s}^2 = \text{cte}$
 $v_{0A} = 0 \text{ m/s}$
 $v_B = 50 \text{ km/h} \approx 13,89 \text{ m/s}$
 t ? s_A ? s_B ?



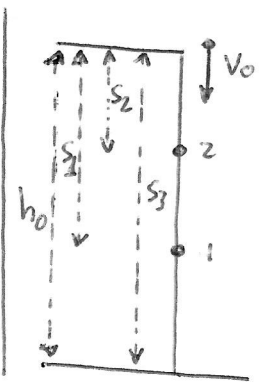
Condiciones $\left\{ \begin{array}{l} t_A = t_B = t \\ s_A + s_B = d_{AB} = 10.000 \text{ m} \end{array} \right.$

$s_A = s_{0A} + v_{0A}t + \frac{1}{2}a_A t^2 = \frac{1}{2}1,2 \text{ m/s}^2 \cdot t^2 = 0,6 \cdot t^2$
 $s_B = s_{0B} + v_B \cdot t = 13,89 t$

$0,6 t^2 + 13,89 t = 10.000 \Rightarrow 0,6 t^2 + 13,89 t - 10.000 = 0$
 $t = \frac{-13,89 \pm \sqrt{13,89^2 - 4 \cdot 0,6 (-10.000)}}{2 \cdot 0,6} = \frac{-13,89 \pm 155,54}{1,2} \Rightarrow t_1 = 118,04 \text{ s}$
 $t_2 < 0$

$s_A = 0,6 (118,04 \text{ s})^2 \approx 8360 \text{ m}$ $s_B = 13,89 \cdot 118,04 \approx 1.640 \text{ m}$

- 14) $h_0 = 150 \text{ m}$
 $v_0 = 5 \text{ m/s}$
 v_1 ? $h_1 = 100 \text{ m}$
 h_2 ? $v_2 = 15 \text{ m/s}$
 v_3 ? $h_3 = 0 \text{ m}$
 t_3 ? " "



a) $s_1 = h_0 - h_1 = 150 \text{ m} - 100 \text{ m} = 50 \text{ m}$; $a_1 = +9,8 \text{ m/s}^2$
 $v_1^2 - v_0^2 = 2a_1 s_1$; $v_1 = \sqrt{v_0^2 + 2a_1 s_1}$

$v_1 = \sqrt{(5 \text{ m/s})^2 + 2 \cdot 9,8 \text{ m/s}^2 \cdot 50 \text{ m}} = 31,70 \text{ m/s}$

b) $v_2^2 - v_0^2 = 2a_2 s_2$; $s_2 = \frac{v_2^2 - v_0^2}{2a_2}$

$s_2 = \frac{(15 \text{ m/s})^2 - (5 \text{ m/s})^2}{2 \cdot 9,8 \text{ m/s}^2} = 10,20 \text{ m}$

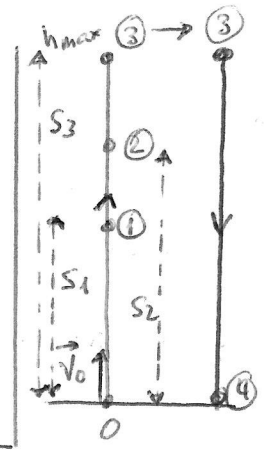
$s_2 = h_0 - h_2 \Rightarrow h_2 = h_0 - s_2 = 150 \text{ m} - 10,20 \text{ m} = 148,8 \text{ m}$

c) $s_3 = h_0 - h_3 = 150 \text{ m} - 0 \text{ m} = 150 \text{ m}$

$v_3^2 - v_0^2 = 2a \cdot s_3$; $v_3 = \sqrt{v_0^2 + 2a s_3} = \sqrt{(5 \text{ m/s})^2 + 2 \cdot 9,8 \text{ m/s}^2 \cdot 150 \text{ m}} = 54,45 \text{ m/s}$

$v_3 = v_0 + a \cdot t_3$; $t_3 = \frac{v_3 - v_0}{a} = \frac{54,45 \text{ m/s} - 5 \text{ m/s}}{9,8 \text{ m/s}^2} = 5,05 \text{ s}$

- 15) $h_0 = 0 \text{ m}$
 $v_0 = 25 \text{ m/s}$
 a) v_1 ? $h_1 = 20 \text{ m}$
 b) h_2 ? $v_2 = 8 \text{ m/s}$
 c) $h_3 = h_{\text{max}}$?
 d) v_4 ? $h_4 = 0 \text{ m}$



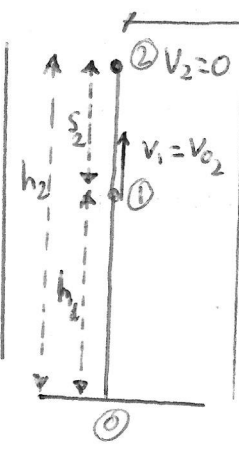
a) $s_1 = h_1 - h_0 = 20 \text{ m}$ $a_1 = -9,8 \text{ m/s}^2 = a_2 = a_3$
 $v_1^2 - v_0^2 = 2 a s_1$; $v_1 = \sqrt{v_0^2 + 2 a s_1}$
 $v_1 = \sqrt{(25 \text{ m/s})^2 + 2(-9,8 \text{ m/s}^2) \cdot 20 \text{ m}} = 15,26 \text{ m/s}$
 b) $v_2^2 - v_0^2 = 2 a s_2$; $s_2 = \frac{v_2^2 - v_0^2}{2 a}$
 $s_2 = \frac{(8 \text{ m/s})^2 - (25 \text{ m/s})^2}{2(-9,8 \text{ m/s}^2)} = 28,62 \text{ m}$

c) $v_3 = 0 \text{ m/s}$; $v_3^2 - v_0^2 = 2 a s_3$; $s_3 = \frac{-v_0^2}{2 a} = \frac{-(25 \text{ m/s})^2}{2(-9,8 \text{ m/s}^2)} = 31,89 \text{ m}$

d) $s_4 = s_3 = 31,89 \text{ m}$; $a_4 = +9,8 \text{ m/s}^2$

Tramo 3→4: $v_4^2 - v_3^2 = 2 a_4 s_4$; $v_4 = \sqrt{2 \cdot a_4 \cdot s_4} = \sqrt{2 \cdot (+9,8 \text{ m/s}^2) \cdot 31,89 \text{ m}} = 25 \text{ m/s} = v_0$

- 17) $h_0 = 0 \text{ m}$
 $a_1 = 4 \text{ m/s}^2$
 $t = 1 \text{ min} = 60 \text{ s}$



a) $a_1 = 4 \text{ m/s}^2$; $s_1 = h_1$; $v_{01} = 0 \text{ m/s}$
 $s_1 = s_0 + v_{01} t_1 + \frac{1}{2} a_1 t_1^2 = \frac{1}{2} 4 \text{ m/s}^2 \cdot (60 \text{ s})^2 = 7.200 \text{ m}$

b) 2º tramo: $a_2 = -9,8 \text{ m/s}^2$; $v_{02} = v_1$; $v_2 = 0$

1º Tramo: $v_1 = v_{01} + a_1 \cdot t_1 = 4 \text{ m/s}^2 \cdot 60 \text{ s} = 240 \text{ m/s} = v_{02}$

2º Tramo: $v_2^2 - v_{02}^2 = 2 \cdot a_2 \cdot s_2$; $s_2 = \frac{v_2^2 - v_{02}^2}{2 a_2} = \frac{-(240 \text{ m/s})^2}{2(-9,8 \text{ m/s}^2)} \Rightarrow$

$s_2 = 2.938,78 \text{ m}$; $h_2 = h_{\text{max}} = h_1 + s_2 = 7.200 \text{ m} + 2.938,78 \text{ m}$

$h_{\text{max}} = 10.138,78 \text{ m}$