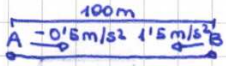
HOJA 1.4 - CINEMÁTICA

① 

a) $x = x_0 + v_0 t + \frac{1}{2} a t^2$

$x_A = 0 + 0 + \frac{1}{2} \cdot 0'5\, t^2$

$x_B = 100 + 0 - \frac{1}{2} \cdot 1'5\, t^2$

$\Big\} \; x_1 = x_2 \rightarrow 0'25t^2 = 100 - 0'75t^2 \rightarrow \boxed{t = 10\,s}$

b) $v = v_0 + at \rightarrow v = 0 + 0'5 \cdot 10 = \boxed{5\ m/s}$

② $v = v_0 + at \rightarrow a = \frac{v - v_0}{t} = \frac{-23'78}{8} = -3'472\ m/s^2$

$x = x_0 + v_0 t + \frac{1}{2} a t^2 \rightarrow x = 0 + 23'78 \cdot 8 + \frac{1}{2} \cdot (-3'472) \cdot 8^2 = \boxed{111'12\ m}$

③ $x = x_0 + v_0 t + \frac{1}{2} a t^2 \rightarrow 50 = 0 + 25t + \frac{1}{2} a t^2 \Big\} \rightarrow a = \frac{50 - 25t}{1/2\, t^2}$

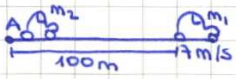
$v = v_0 + at \rightarrow 0 = 25 + at$ ↗

$\rightarrow 25 + t \cdot \left(\frac{50 - 25t}{1/2\, t^2} \right) = 0 \; ; \left(25 + \frac{50t - 25t^2}{1/2\, t^2} = 0 \right) \cdot \frac{1}{2} t^2 \; ; \; 12'5t^2 + 50t - 25t^2 = 0 \; ;$

$t(12'5t + 50 - 25t) = 0 \rightarrow t \neq 0$

$50 - 12'5t = 0 \rightarrow t = 4\,s$

$0 = 25 + at \rightarrow 0 = 25 + 4a \; ; \; -25 = 4a \rightarrow \boxed{a = -6'25\ m/s^2}$

④ 

m_1 = MRU: $x = x_0 + vt \rightarrow x_1 = 100 + 7t$

m_2 = MRUA: $x = x_0 + v_0 t + \frac{1}{2} a t^2 \rightarrow x_2 = 0 + 0 + \frac{1}{2} \cdot 1 \cdot t^2 \Big\} \; x_1 = x_2 \rightarrow 100 + 7t = \frac{1}{2} t^2 \; ;$

$0'5t^2 - 7t - 100 = 0 \rightarrow$

$\rightarrow t = \frac{7 \pm \sqrt{49 + 200}}{1} = 7 + 15'78 = \boxed{22'78\,s}$

$x_1 = 100 + 7t = 100 + 7 \cdot 22'78 = \boxed{259'46\ m}$

⑤

⑥ $v = -gt \rightarrow t = \frac{v}{-g} = \frac{35}{-10} = \boxed{3'5\,s}$

⑦ 

a) $y = y_0 - \frac{1}{2}gt^2 \rightarrow 0 = 80 - \frac{1}{2}\cdot 10\cdot t^2 \rightarrow 5t^2 = 80 \rightarrow \boxed{t = 4\,s}$

b) $y = y_0 - \frac{1}{2}gt^2 \rightarrow y = 80 - \frac{1}{2}\cdot 10\cdot 2^2 = \boxed{60\,m}$

⑧ a) $y = y_0 - \frac{1}{2}gt^2 \rightarrow 0 = y_0 - \frac{1}{2}\cdot 10\cdot 3'5^2 \rightarrow \boxed{y_0 = 61'25\,m}$

b) $v = -gt \rightarrow v = -10\cdot 3'5 = \boxed{-35\,m/s}$

⑨ $y = y_0 + v_0 t - \frac{1}{2}gt^2 \rightarrow y = 0 + 15t - \frac{1}{2}\cdot 9'8\cdot t^2 \rightarrow y = 15\cdot 1'53 - \frac{1}{2}\cdot 9'8\cdot 1'53^2$;

$v = v_0 - gt \rightarrow 0 = 15 - 9'8t \rightarrow t = 1'53\,s.$ $\boxed{y = 11'48\,m}$

⑩ a) $v = v_0 - gt \rightarrow v_0 = v + gt \rightarrow v_0 = 0 + 10\cdot 3 = \boxed{30\,m/s}$

b) $y = y_0 + v_0 t + \frac{1}{2}gt^2 \rightarrow y = 0 + 30\cdot 3 - \frac{1}{2}\cdot 10\cdot 3^2 = \boxed{45\,m}$