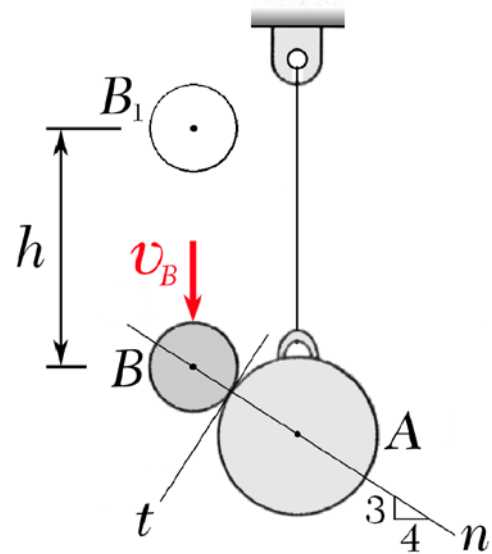


MEEG 2013 [Quiz #4.m22](#)

A 2-kg sphere B is released to fall freely from position B_1 to strike with a velocity $\mathbf{v}_B = 12 \text{ m/s} \downarrow$ at a 5-kg sphere A that is at rest as shown. If the coefficient of restitution between A and B is $e = 0.65$, determine (a) the height h , (b) the velocity \mathbf{v}'_A of A just after impact.



$$T_1 + V_1 = T_2 + V_2 : \quad 0 + 2(9.81)h = \frac{1}{2}(2)(12)^2 + 0$$

$$h = 7.339 \quad \therefore \mathbf{h = 7.34 \text{ m}} \quad \textcircled{2}$$

$$B \begin{matrix} \downarrow 2(12) \\ t \end{matrix} + B \begin{matrix} F_B(\Delta t) \\ t \end{matrix} = B \begin{matrix} 2v'_{Bn} \\ t \end{matrix} + B \begin{matrix} 2v'_{Bt} \\ t \end{matrix} \quad \textcircled{1}$$

$$+\swarrow \Sigma V_t : \quad 2(12)\left(\frac{4}{5}\right) + 0 = 2v'_{Bt} \quad \therefore v'_{Bt} = 9.6 \text{ m/s} \quad \textcircled{1}$$

$$B \begin{matrix} \downarrow 2(12) \\ t \end{matrix} + A \begin{matrix} F_A(\Delta t) \\ t \end{matrix} = B \begin{matrix} 2v'_{Bn} \\ t \end{matrix} + A \begin{matrix} 5v'_A \\ t \end{matrix} \quad \textcircled{1}$$

$$\rightarrow \Sigma V_x : \quad 0 + 0 = 2v'_{Bn}\left(\frac{4}{5}\right) - 2(9.6)\left(\frac{3}{5}\right) + 5v'_A \quad \textcircled{1}$$

$$\text{Impact:} \quad v'_{Bn} - v'_A\left(\frac{4}{5}\right) = 0.65 \left[0 - 12\left(\frac{3}{5}\right) \right] \quad \textcircled{2}$$

$$v'_A = 3.027 \quad v'_{Bn} = -2.259 \quad \therefore \mathbf{v'_A = 3.03 \text{ m/s} \rightarrow} \quad \textcircled{2}$$