

$$\textcircled{1} \quad 0 = (m_1 + m_2)u + m_3 v_0 \quad u = -\frac{m_3}{m_1 + m_2} v_0$$

$$u = -\frac{10}{3} \frac{\text{m}}{\text{s}} \quad 0 = v_0^2 + 2as \rightarrow S = \frac{v_0^2}{2a}$$

$$Ma = -MN = -MMg \rightarrow S = + \frac{v_0^2}{2Mg} = 278 \text{ m}$$

$$2) (m_1 + m_2 + m_3)v_1 = (m_1 + m_2)u + m_3 v_0$$

$$u = 17 \frac{\text{m}}{\text{s}} ; S = 72,5 \text{ m}$$

$$3) -(m_1 + m_2 + m_3)v_1 = (m_1 + m_2)u + m_3 v_0 \quad u = 8,4 \frac{\text{m}}{\text{s}} ; S = 1764 \text{ m}$$

$$\textcircled{2} \quad mv_0 = (m+M)u ; \frac{(m+M)u^2}{2} = (m+M)gh ; h = L(1 - \cos 10^\circ)$$

$$v_0 = \frac{m+M}{m} \sqrt{2gL(1 - \cos 10^\circ)} \approx 551 \frac{\text{m}}{\text{s}}$$

$$\textcircled{3} \quad mv_0 = (m+M)u ; \frac{(m+M)u^2}{2} = (m+M)g2L$$

$$u = \frac{m}{2(m+M)} \sqrt{2gL}$$

$$\textcircled{4} \quad mgh_1 = \frac{mv^2}{2} ; \Rightarrow v = \sqrt{2gh_1} ; u = \frac{1}{2}v$$

$$\frac{mu^2}{2} = mgh_2 ; h_2 = \frac{u^2}{2g} = \left(\frac{1}{2}v\right)^2 \frac{1}{2g}$$

$$h_2 = \frac{1}{4}h_1 = 0,5 \text{ m}$$

$$\frac{mv^2}{2} = \frac{mu^2}{2} + Q$$

$$v = \sqrt{2 \cdot 10 \cdot 2} = 2 \cdot \sqrt{10}$$

$$Q = \frac{m}{2}(v^2 - u^2) = \frac{3}{4} \frac{mv^2}{2} = \frac{3}{8} mv^2 = \frac{3}{2} \cdot 0,1 (2\sqrt{10})^2 = \frac{3}{2} \text{ J}$$