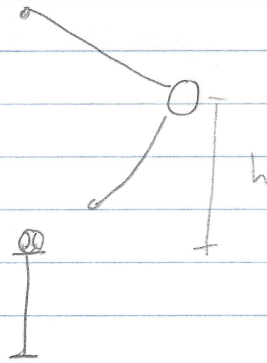


20-P-MOM-DY-8

6.500kg

A pendulum is used to hit a baseball off a tee. The pendulum consists of a 5kg mass and rope. $e = 0.7$. If the mass is lifted to $h = 2m$ above the ball, How much energy is lost in the impact?



$$mgh = \frac{1}{2}mv^2 \quad v = \sqrt{gh} = 6.26 \frac{m}{s}$$

$$e = \frac{(V_B)_2 - (V_A)_2}{(V_A)_1 - (V_B)_1} \quad \begin{array}{l} V_B = \text{pendulum} \\ V_A = \text{baseball} \end{array}$$

$$e = \frac{(V_B)_2 - (V_A)_2}{-(V_B)_1} \quad (V_B)_1 = (V_B)$$

$$m_p V_B = m_p (V_B)_2 + m_b (V_A)_2$$

$$(V_B)_2 = (V_A)_2 - (V_B)_1 e$$

$$m_p V_B = m_p [(V_A)_2 - (V_B)_1 e] + m_b (V_A)_2$$

$$(V_A)_2 = 9.6741 \frac{m}{s}$$

$$(V_B)_2 = 5.2921 \frac{m}{s}$$

$$\frac{1}{2} m_p V_B^2 + \frac{1}{2} m_b V_A^2 \quad \text{After} = 193.421$$

$$\text{Before} \quad \frac{1}{2} m_p (V_B)_1^2 = 97.969$$

$$\text{energy loss} = 4.544 \text{ J}$$