

9-23)



Conservation of momentum = $m_1 u_1 = (m_1 + m_2) v$

$$\Rightarrow v = \frac{m_1}{m_1 + m_2} u_1$$

Fraction of KE lost = $\frac{KE_{\text{initial}} - KE_{\text{final}}}{KE_{\text{initial}}}$

$$= \frac{m_1 u_1^2 / 2 - \frac{(m_1 + m_2)}{2} v^2}{m_1 u_1^2 / 2}$$

$$= 1 - \frac{(m_1 + m_2)}{m_1} \left(\frac{v}{u_1} \right)^2 = 1 - \left(\frac{m_1 + m_2}{m_1} \right) \left(\frac{m_1}{m_1 + m_2} \right)^2$$

$$= 1 - \frac{m_1}{m_1 + m_2} = \frac{m_2}{m_1 + m_2}$$