5. 

Initial: $E_{k0} = \frac{1}{2} m_1 v^2$

$m_1 v = (m_1 + m_2) v'$ Momentum Conservation

$E_k' = \frac{1}{2}(m_1+m_2) v'^2$

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

$= \frac{1}{2}\frac{m_1^2 v^2}{m_1+m_2} = \frac{m_1^2 v^2}{2(m_1+m_2)}$

$$\eta = \left|\frac{E_k' - E_{k0}}{E_{k0}}\right| = \left|\frac{\frac{m_1^2 v^2}{2(m_1+m_2)} - \frac{1}{2}m_1 v^2}{\frac{1}{2}m_1 v^2}\right| = \left|\frac{\frac{m_1}{2(m_1+m_2)} - \frac{1}{2}}{\frac{1}{2}}\right| = \left|\frac{m_1}{m_1+m_2} - 1\right|$$

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

$m_1 \to 0$ $\quad \eta = 100\%$

$m_2 \to 0$ $\quad \eta = 0\%$