PROB. 13-155

$\vec{v}_A = (2)\hat{i}\ \frac{m}{s}$, $\vec{v}_B = (-1.5)\hat{i}\ \frac{m}{s}$, $m_A = 5^{kg}$, $m_B = 3^{kg}$

$e = 0.80$

a) FIND VELOCITIES AFTER IMPACT

CONSERVATION OF MOMENTUM:

$m_A \vec{v}_A + m_B \vec{v}_B = m_A \vec{v}_A' + m_B \vec{v}_B'$

$(5^{kg})(2\frac{m}{s}) + (3^{kg})(-1.5\frac{m}{s}) = (5^{kg})v_A' + (3^{kg})v_B'$

$v_A' = \frac{1}{5}(5.5 - 3v_B') = 1.1 - 0.6v_B'$

COEFFICIENT OF RESTITUTION:

$v_B' - v_A' = e(v_A - v_B) = (0.8)[(2) - (-1.5)\frac{m}{s}] = 2.8$

$v_B' - (1.1 - 0.6v_B') = 2.8$

$\boxed{v_B' = 2.437\ \frac{m}{s}}$ $\quad v_A' = 1.1 - 0.6(2.437) \boxed{= -0.3625\ \frac{m}{s}}$

b) FIND ENERGY LOSS DURING IMPACT

$(T_A + T_B) = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B^2 = \frac{1}{2}[(5^{kg})(2\frac{m}{s})^2 + (3^{kg})(1.5\frac{m}{s})^2]$

$= 13.37\ N\cdot m$

$(T_A + T_B)' = \frac{1}{2}m_A(v_A')^2 + \frac{1}{2}m_B(v_B')^2$

$= \frac{1}{2}[(5)(0.3625)^2 + (3)(2.437)^2] = 9.237\ N\cdot m$

$\boxed{\Delta T = 4.133\ N\cdot m}$