

BOXCAR PROBLEM:
 Two boxcars A (17500 kg), B (20000 kg) are on a straight track. A collides with B from behind at a speed of 5.45 m/s and B is originally stopped. If they stick upon collision what is their common speed after, the impulse on each, and show calculations to determine if the collision is elastic or not.

a) $P = P'$
 $m_A v_A + m_B v_B = (m_A + m_B) v'$
 $(17500)(5.45) + (20000)(0) = (37500) v'$
 $95375 = 37500 v'$
 $v' = 2.543 \frac{m}{s}$

b) $\vec{p}_A = m_A \Delta v = (17500)(2.543 - 5.45)$
 $= -50872.5 \frac{kg \cdot m}{s} \quad (5.09 \times 10^4)$
 $\vec{p}_B = m_B \Delta v = (20000)(2.543 - 0)$
 $= +50860 \frac{kg \cdot m}{s} \quad (5.09 \times 10^4)$

c) Elastic $KE = KE'$
 $\frac{1}{2}(17500)(5.45)^2 + 0 = \frac{1}{2}(37500)(2.543)^2$
 $259896.9 \text{ J} = 121253.4 \text{ J}$
 highly inelastic \leftarrow less than half the initial!

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