

Answer on Question #67897 - Physics – Mechanics/Relativity

Question

A heavy vehicle moving with velocity 15m/s strikes an object of very small mass at rest head on elastically. Velocity of object after collision is?

Solution:

$$\begin{cases} Mv = Mv_1 + mv_2 \\ Mv^2 = Mv_1^2 + mv_2^2 \end{cases}$$

$$\begin{cases} M(v - v_1) = mv_2 \\ M(v^2 - v_1^2) = mv_2^2 \end{cases}$$

$$\begin{cases} M(v - v_1) = mv_2 \\ M(v - v_1)(v + v_1) = mv_2^2 \end{cases}$$

$$v + v_1 = v_2 \rightarrow v_1 = v_2 - v$$

$$Mv = M(v_2 - v) + mv_2$$

$$2Mv = v_2(M + m) \rightarrow v_2 = \frac{2Mv}{M + m}$$

if $M \gg m$, then $v_2 = 2v$

$$v_2 = 2 \cdot 15\text{m/s} = 30\text{m/s}$$

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