Answer on Question #41965 - Physics - Mechanics | Kinematics | Dynamics

A 40,000 kg railroad car initially traveling at 10 m/s collides inelastically with a 20,000 kg railroad car initially at rest. The cars stick together. What is their final speed?

Solution:

Given:

$= 40000$ kg,

$_2 = 20000$ kg,

$v_{\ i} = 10$ m/s,

$v_{2i} = 0,$

$v_f = ?$

The equation that denotes the conservation of momentum is:

$$v_{\ i} + \ _2 v_{2i} = (m \ + \ _2) v_f$$

where, m_1 = mass of object or body 1

m_2 = mass of object or body 2

$v_{\ i}$ = initial velocity of object or body 1

v_{2i} = initial velocity of object or body 2

v_f = final velocity of both the objects

The final velocity is given by

$$v_f = \frac{v_{\ i} + \ _2 v_{2i}}{ + \ _2}$$

$$v_f = \frac{40000 \cdot 10}{40000 + 20000} = \frac{20}{3} = 6.67 \text{ m/s}$$

Answer. $v_f = 6.67$ m/s.