Answer on Question #45540 – Physics – Other

Question.

Two small glass spheres of masses 10g and 20g are moving in a straight line in the same direction with velocities of 3m/s and 2m/s respectively. They collide with each other and after collision, glass sphere of mass 10g moves with a velocity of 2.5m/s. Find the velocity of the second ball after collision.

Given:

$m_1 = 10\ g = 0.01\ kg$

$m_2 = 12\ g = 0.02\ kg$

$v_1 = 3\ \frac{m}{s}$

$v_2 = 2\ \frac{m}{s}$

$v'_1 = 2.5\ \frac{m}{s}$

Find:

$v'_2 = ?$

Solution.

By definition the momentum is:

$$p = mv$$

The law of conservation of momentum:

$$p_0^{system} = p^{system}$$

$$p_0^{system} = m_1 v_1 + m_2 v_2$$

$$p^{system} = m_1 v'_1 + m_2 v'_2$$

So,

$$m_1 v_1 + m_2 v_2 = m_1 v'_1 + m_2 v'_2$$

Therefore,

$$v'_2 = \frac{m_1 v_1 + m_2 v_2 - m_1 v'_1}{m_2}$$

Calculate:

$$v'_2 = \frac{0.03 + 0.04 - 0.025}{0.02} = \frac{0.045}{0.02} = 2.25\ \frac{m}{s}$$

Answer.

$$v'_2 = \frac{m_1 v_1 + m_2 v_2 - m_1 v'_1}{m_2} = 2.25\ \frac{m}{s}$$