Answer on Question 45848, Physics, Mechanics | Kinematics | Dynamics

Two particles of each rest mass 3x10(to the power -25) kg approaching each other in head on collision. If each particle has an initial velocity of 2x10(to the power 8) m/s, calculate the velocity of one particle as run by the other

Solution:

Let $v_1(0)$ and $v_2(0)$ be the initial velocities of first and second particle respectively. In current case, $v_1(0) = v_0; v_2(0) = -v_0$, where $v_0 = 2 \cdot 10^8 \frac{m}{s}$.

Let the velocities of the particles after collision be v_1 and v_2.

Using law of conservation of linear momentum, obtain $m[v_1(0) + v_2(0)] = m(v_1 + v_2)$, where the left side is equal to zero because $v_1(0) = v_0; v_2(0) = -v_0$, hence $v_1 = -v_2$.

Using law of conservation of energy, obtain $m[v_1^2(0) + v_2^2(0)] = m[v_1^2 + v_2^2]$. Substituting $v_2 = -v_1$ into last equation, obtain $2mv_0^2 = 2mv_1^2$, therefore $v_1 = -v_0$ and $v_2 = -v_1 = v_0$.

Thus, after collision, particles move in their opposite directions with the same speeds as their initial ones.