Answer on Question 58111, Physics, Other

Question:

20. Two trolleys X and Y with momenta $20\ Ns$ and $12\ Ns$, respectively, travel along a straight line in opposite directions before a collision. After the collision, the directions of motion of both trolleys are reversed and the magnitude of the momentum of X is $2\ Ns$. What is the magnitude of the corresponding momentum of Y?

a) $6\ Ns$

b) $8\ Ns$

c) $10\ Ns$

d) $30\ Ns$

Solution:

From the Law of Conservation of Momentum we have:

$$p_{X\ (initial)} + p_{Y\ (initial)} = p_{X\ (final)} + p_{Y\ (final)}.$$

Let's assume that the trolley X travels along a straight line to the right in positive direction. Then, the trolley Y travels along a straight line in the opposite direction to the first one (to the left).

Then, from the last formula we can find the momentum of trolley Y after collision:

$$p_{X\ (initial)} - p_{Y\ (initial)} = -p_{X\ (final)} + p_{Y\ (final)},$$

$$20\ Ns\ - 12\ Ns = -2\ Ns + p_{Y\ (final)},$$

$$p_{Y\ (final)} = 20\ Ns\ - 12\ Ns + 2\ Ns = 10\ Ns.$$

Answer:

c) $10\ Ns$