Elastic Collisions

A collision is elastic if the total kinetic energy before the collision is the same as the total kinetic energy after the collision.

Never assume that the collision is elastic .... you must first apply the Law of Conservation of Momentum to find any missing masses or velocities.

MP|320

+ the original direction of Billiard Ball

	Bill	Steel	Bill	Steel
m	0.250kg	0.800kg	0.250 kg	0.800kg
v	+5.00m/s	0	-2.62 m/s	v
p	+1.25 kg·m/s	0	-0.655 kg·m/s	(0.800kg) v
	$\vec{P}_{total}$		$\vec{P}'_{total}$	

According to the Law of Conservation of momentum:

$$\vec{P}_{total} = \vec{P}'_{total}$$

$$\vec{P}_{bill} + \vec{P}_{steel} = \vec{P}'_{bill} + \vec{P}'_{steel}$$

$$+1.25\,kg\cdot m/s + 0 = -0.655\,kg\cdot m/s + (0.800kg)\,v'_{steel}$$

$$1.905\,kg\cdot m/s = (0.800kg)\,v'_{steel}$$

$$v'_{steel} = +2.38\,m/s$$

$\vec{v}'_{steel} = 2.38\,m/s$ [in the original direction of the bill ball]

Kinetic Energy Before:

Bill: $E_K = \frac{1}{2}(0.250kg)(5.00m/s)^2 = 3.125J$

Steel: $E_K = 0J$

$E_{k(total)} = 3.125J \approx 3.12J$

Kinetic Energy After:

Bill: $E_K = \frac{1}{2}(0.250kg)(2.62m/s)^2 = 0.85805J$

Steel: $E_K = \frac{1}{2}(0.800kg)(2.38m/s)^2 = 2.26576J$

$E'_{k(total)} = 3.12381J \approx 3.12J$

Since the total kinetic energy before the collision is the same as the total kinetic energy after the collision, the collision is elastic.

TO DO:

PP|315

PP|317

PP|322