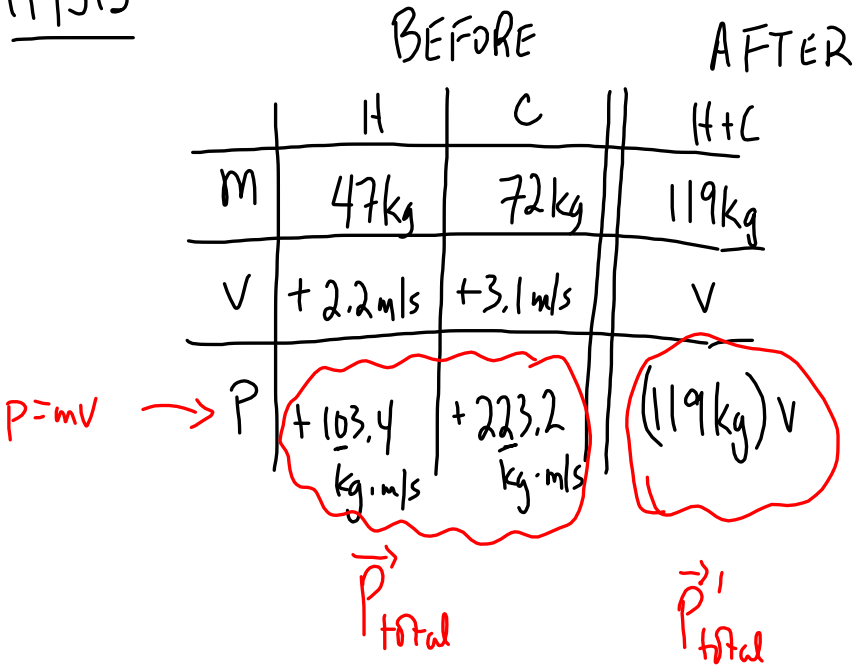
PP|315



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

$$103.4\,kg\cdot m/s + 223.2\,kg\cdot m/s = (119kg)v$$

$$326.6\,kg\cdot m/s = (119kg)v$$

$$v = +2.7\,m/s$$

$\vec{v} = 2.7\,m/s$ [in their original direction]

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	BEFORE	AFTER	
	uranium	alpha	uranium - alph
m	3.95×10^{-25} kg	6.64×10^{-27} kg	$(3.95\times10^{-25} - 6.64\times10^{-27})$ 3.8836×10^{-25} kg
V	0	1.42×10^{4} m/s	V
P	0	9.4288×10^{-23} kg·m/s	$(3.8836\times10^{-25}\text{ kg})V$

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

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

$$0 = 9.4288\times10^{-23}\text{ kg·m/s} + (3.8836\times10^{-25}\text{ kg})V$$

$$-9.4288\times10^{-23}\text{ kg·m/s} = (3.8836\times10^{-25}\text{ kg})V$$

$$V = -243\text{ m/s}$$

$\vec{V}$ = 243 m/s [opp the alpha particle]

Elastic Collisions

A collision is elastic if the kinetic energy is conserved during the collision. Not every collision is elastic!

* Every collision => conservation of momentum
* Some collisions => conservation of kinetic energy and are elastic collisions.

MP|320

	BEFORE		AFTER	
	Bill	Steel	Bill	Steel
m	0.250kg	0.800kg	0.250kg	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

+ the original direction of billiard ball.

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

* First we need to find the velocity of the Steel ball after the collision.

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

$$1.25\,kg\cdot m/s + 0 = -0.655\,kg\cdot m/s + (0.800kg)v$$

$$1.905\,kg\cdot m/s = (0.800kg)v$$

$$v = +2.38\,m/s$$

Now work out the KE before + after:

$\vec{v} = 2.38\,m/s$ [in the original dir of the billiard ball]

BEFORE:

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

Steel: $E_K = 0\,J$

} 3.125J (TOTAL)

AFTER

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

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

} 3.124J (TOTAL)

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

TO DO

PP|322