

PP/317

	BEFORE	AFTER
	U-238	alpha U-238-alpha
<i>+ dir of alpha.</i>	m $3.95 \times 10^{-25} \text{ kg}$	$6.64 \times 10^{-27} \text{ kg}$ $3.88 \times 10^{-25} \text{ kg}$
	v	$+1.42 \times 10^4 \text{ m/s}$ v
<i>mv</i> → P	0	$9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s}$ $(3.88 \times 10^{-25} \text{ kg})v$
	P_{total}	P'_{total}

$$P_{\text{total}} = P'_{\text{total}}$$

$$0 = (9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s}) + (3.88 \times 10^{-25} \text{ kg})v$$

$$(-3.88 \times 10^{-25} \text{ kg})v = 9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s}$$

$$v = \frac{9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s}}{-3.88 \times 10^{-25} \text{ kg}}$$

$$v = -2.43 \times 10^2 \text{ m/s}$$

$$\vec{v} = 2.43 \times 10^2 \text{ m/s [opp the alpha particle]}$$

Elastic collisions

In every collision (in an isolated system), momentum is conserved.

In SOME collisions, kinetic energy is also conserved. (i.e. the total kinetic energy before is equal to the total kinetic energy after). IF kinetic energy is conserved, the collision is called an elastic collision.

MP/320

	BEFORE		AFTER	
	Bill	Steel	Bill	Steel
m	0.250kg	0.800kg	0.250kg	0.800kg
v	+5.00m/s	0	-2.62m/s	v
p	+1.25 kg·m/s	0	-0.655 kg·m/s	(0.800kg)v

+ the orig dir of Bill

p = mv

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

$$P_{total} = P'_{total}$$

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

$$1.905 \text{ kg}\cdot\text{m/s} = (0.800 \text{ kg})v$$

$$v = +2.38 \text{ m/s}$$

$$\vec{v} = 2.38 \text{ m/s} \text{ [in the original direction of Bill]}$$

In order to see if the collision is elastic, you need to work out the KE before and after:

BEFORE:

Bill: $E_k = \frac{1}{2}(0.250 \text{ kg})(5.00 \text{ m/s})^2 = 3.125 \text{ J}$
 Steel: $E_k = 0 \text{ J}$ } 3.125 J

AFTER:

Bill: $E_k = \frac{1}{2}(0.250 \text{ kg})(2.62 \text{ m/s})^2 = 0.85805 \text{ J}$
 Steel: $E_k = \frac{1}{2}(0.800 \text{ kg})(2.38 \text{ m/s})^2 = 2.26576 \text{ J}$ } 3.12381 J

↑ SAME
 KE was conserved + collision was elastic.

IMPORTANT

In an elastic collision, both momentum + kinetic energy are conserved.

In an inelastic collision, only momentum is conserved

TO DO: PP/322