

Conservation of Mechanical Energy:

$$E_{total} = E'_{total}$$

(assuming that there are no non-conservative forces acting on the object)

Conservation of Momentum

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

(neglecting friction)

PP/317

29.

	BEFORE	AFTER	
	uranium	alpha	uranium-alpha
M	$3.95 \times 10^{-25} \text{ kg}$	$6.64 \times 10^{-27} \text{ kg}$	$3.8836 \times 10^{-25} \text{ kg}$
v	0	$1.42 \times 10^4 \text{ m/s}$	v
P	0	$9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s}$	$(3.8836 \times 10^{-25} \text{ kg})v$



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

$$0 = 9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s} + (3.8836 \times 10^{-25} \text{ kg})v$$

$$-9.43 \times 10^{-23} \text{ kg}\cdot\text{m/s} = (3.8836 \times 10^{-25} \text{ kg})v$$

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

Elastic Collision

In every collision (neglecting friction) we will apply the Law of Conservation of Momentum.

In some collisions, Kinetic Energy is conserved. This is called an Elastic Collision.

MP/320

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

+ original direction of Bill Ball.

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

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

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

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

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

BEFORE: $\vec{v} = 2.38 \text{ m/s}$ [in the original direction of the bill ball]

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

Steel Ball: $E_k = 0$

TOTAL: $E_k = 3.125 \text{ J}$
3.12 J 3sd.

AFTER:

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

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

3.12381 J

Since Kinetic Energy was conserved during this collision, it was elastic. 3.12 J 3sd

TD 20

① PP/322

② p 328/20-23, 25, 27-31

Note: 29 => 60t includes the torpedo.

③ Hw Probe - Thurs

(PP/287 or PP/296)