

AP Physics - Momentum - Elastic + Inelastic

Note Title

10/19/2007

2 Ideal Types of Collisions

Elastic - "Bounce" - Kinetic energy is conserved

$$\Sigma P_{\text{before}} = \Sigma P_{\text{after}}$$

$$\Sigma KE_{\text{before}} = \Sigma KE_{\text{after}}$$

$$m_1 \vec{v}_{1i} + m_2 \vec{v}_{2i} = m_1 \vec{v}_{1f} + m_2 \vec{v}_{2f}$$

$$\frac{1}{2} m_1 v_{1i}^2 + \frac{1}{2} m_2 v_{2i}^2 = \frac{1}{2} m_1 v_{1f}^2 + \frac{1}{2} m_2 v_{2f}^2$$

Inelastic - "Stick" (aka. "smush") - Kinetic energy is lost to heat

$$\Sigma P_{\text{before}} = \Sigma P_{\text{after}}$$

$$\Sigma KE_{\text{before}} \neq \Sigma KE_{\text{after}}$$

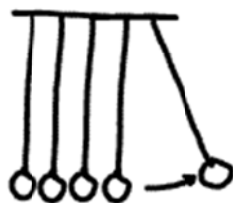
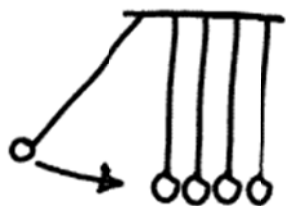
$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$$

$$\frac{1}{2} m_1 v_{1i}^2 + \frac{1}{2} m_2 v_{2i}^2 = \frac{1}{2} m_1 v_{1f}^2 + \frac{1}{2} m_2 v_{2f}^2 + \text{heat}$$

Swinging balls:

If you lift up one ball to the side, exactly one ball will come out the other side.

Why is this always the case?



→ Because this is the only possibility which satisfies both conservation of momentum and conservation of energy.

→ See page 19 for discussion and solution.