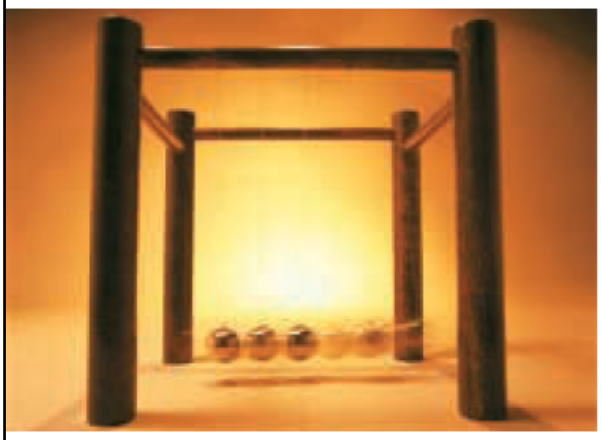
Collisions-Elastic vs In-elastic Collisions



- Momentum is ALWAYS conserved before and after a collision.
- If 'energy' is also conserved, the collision is defined as 'elastic'.
- If there is energy loss of any type, the collision is termed 'in-elastic'.

What are some types of energy?

Classifying a Collision

A 0.0520 kg golf ball is moving east with a velocity of 2.10 m/s when it collides, head on, with a 0.155 kg billiard ball. If the golf ball rolls directly backward with a velocity of –1.04 m/s, was the collision elastic?

Calculations

$$m_g v_g + m_b v_b = m_g v_g' + m_b v_b'$$

$$m_g v_g + 0.0 - m_g v_g' = m_b v_b'$$

$$v_b' = \frac{m_g v_g - m_g v_g'}{m_b}$$

$$v_b' = \frac{(0.0520\ \text{kg})(2.10\ \frac{\text{m}}{\text{s}}) - (0.0520\ \text{kg})(-1.04\ \frac{\text{m}}{\text{s}})}{0.155\ \text{kg}}$$

$$v_b' = 1.0534\ \frac{\text{m}}{\text{s}}$$

Calculate the kinetic energy of the golf ball before the collision.

$$E_{kg} = \frac{1}{2} m_g v_g^2$$

$$E_{kg} = \frac{1}{2}(0.0520\ \text{kg})\left(2.10\ \frac{\text{m}}{\text{s}}\right)^2$$

$$E_{kg} = 0.114\ 66\ \text{J}$$

Calculate the sum of the kinetic energies of the balls after the collision.

$$E'_{kg} = \frac{1}{2} m_g v'^2_g$$

$$E'_{kg} = \frac{1}{2}(0.0520\ \text{kg})\left(-1.04\ \frac{\text{m}}{\text{s}}\right)^2$$

$$E'_{kg} = 0.028\ 12\ \text{J}$$

$$E'_{kb} = \frac{1}{2} m_b v'^2_b$$

$$E'_{kb} = \frac{1}{2}(0.155\ \text{kg})\left(1.0534\ \frac{\text{m}}{\text{s}}\right)^2$$

$$E'_{kb} = 0.086\ 00\ \text{J}$$

$$E'_{kg} + E'_{kb} = 0.028\ 12\ \text{J} + 0.085\ 99\ \text{J}$$

$$E'_{kg} + E'_{kb} = 0.114\ 12\ \text{J}$$