

Conservation of Momentum and Energy

Aim: Experimentally demonstrate conservation of momentum and energy through a collision.

Method:

1. Determine the instantaneous velocity of trolley 1
2. Calculate the initial momentum and energy of the system
3. Collide the trolleys
4. Determine the instantaneous velocity of trolley 1/2
5. Calculate the final momentum and energy of the system
6. Compare the initial and final momentum
7. Repeat with a larger mass trolley 2

Results:

1. Instantaneous velocity of trolley 1

Measure the distance/time travelled, calculate the average velocity, instantaneous velocity = 2 * average velocity.

Trial	Displacement (m)	Time (s)
1		
2		
3		
Average		

Average velocity = avg_u₁ =

Instantaneous velocity = u₁ =

2. Calculate the initial momentum and energy

Mass of trolley 1 = m₁ =

p_i = m₁u₁ + m₂u₂

p_i = + 0

p_i =

E_i = PE_i + KE_i

$$E_i = 0 + (\frac{1}{2}m_1u_1 + \frac{1}{2}m_2u_2)$$

$$E_i = 0 + (\frac{1}{2} * \quad * \quad + 0)$$

$$E_i =$$

4. Determine the instantaneous velocity of trolley 1/2

Measure the distance/time travelled, calculate the average velocity,
instantaneous velocity = 2 * average velocity.

Trial	Displacement (m)	Time (s)
1		
2		
3		
Average		

$$\text{Average velocity} = \text{avg_}v_1 =$$

$$\text{Instantaneous velocity} = v_1 =$$

5. Calculate the final momentum and energy

$$\text{Mass of trolley 2} = m_2 =$$

$$p_f = (m_1 + m_2)v$$

$$p_f =$$

$$p_f =$$

$$E_f = PE_f + KE_f$$

$$E_f = 0 + \frac{1}{2}(m_1 + m_2)v_2$$

$$E_f = 0 +$$

$$E_f =$$

6. Compare the initial momentum and energy with the final momentum and energy.

Initial momentum:

Final momentum:

Initial energy:

Final energy:

Conclusion: