

Momentum of a collision

Perform first-hand investigations to gather data and analyse the change in momentum during collisions

Aim:

To test the law of conservation of momentum by analysing the momentum of two trolleys colliding

Hypothesis

Momentum is conserved during a collision. That is, the total momentum of a system before a collision will equal the total momentum after the collision.

Method

- Set up two trolleys with Velcro strips (or plasticine) facing each other, on a surface sloping to compensate for friction in one direction. As the diagram shows, the trolleys are aimed to travel towards each other and for the velcro (or plasticine) to stick when they collide.
- Use a data logger or record the motion using a camera to determine the velocities before and after the collision.
- Use the data logger or movie to determine the velocity before and after the collision.
- Measure the mass of each trolley.

Sep 8-7:37 PM

Results

	Trolley 1	Trolley 2
Initial velocity = u (m/s)	0	0.326
Final velocity = v (m/s)	0.0909	0.0909
mass (g)	1598.8	599.8

Calculations

$$\text{Initial Momentum} = m_1 u_1 + m_2 u_2$$

$$= 1.5988 \times 0 + 0.5998 \times 0.326 = 0.1955 \text{ kgm/s}$$

$$\text{Final Momentum} = m_1 v_1 + m_2 v_2 \text{ [Note } v_1 = v_2]$$

$$= (m_1 + m_2)v$$

$$= (2.1986) \times 0.0909 = 0.1998 \text{ kgm/s}$$

Conclusion

Final momentum was equal to the initial momentum within the 2 significant figures of our velocity measurements

Discussion of Reliability and validity

To improve the reliability we would need to repeat the experiment a number of times - perhaps with different masses, velocities and distances covered.

Validity could be improved by moving the ruler to be above the trolley (reducing parallax) and by moving the camera further back. A data logger would also reduce the measurement errors.

Sep 8-7:39 PM