Edexcel Physics IAL

Core Practical 10: Analysing Collisions Between Small Spheres

Practical Notes

Core Practical 10: Use ICT to Analyse Collisions Between Small Spheres, e.g. ball bearings on a table top

Equipment:

- Small spheres
- Video camera and tripod
- Ruler
- Vernier Callipers
- Mass balance

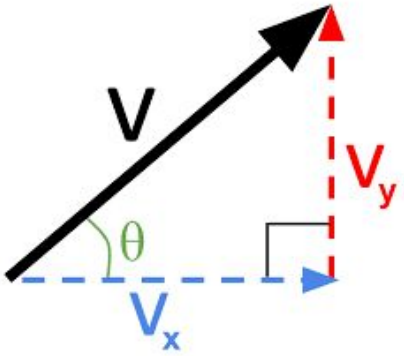
Method

1. Record the masses, m, of the two spheres using a mass balance then place them on a level table top.
2. Position two metre rulers perpendicular to each other using a set square.
3. Position a video camera above the table top (bird's eye view) and start camera recording.
4. Roll one sphere towards the stationary sphere and allow them to collide and roll.
5. Stop recording when both spheres come to rest.
6. Import video to tracking software, and calibrate distance and a 90° angle using the metre rulers.
7. Go through each frame of the video, use the rulers to calculate the distance travelled and calculate the time between each frame.
8. Calculate the initial and final velocity of the spheres using Pythagoras Theorem:

$$V = \sqrt{(V_x)^2 + (V_y)^2}$$

where V_x is the horizontal component of velocity and V_y is the vertical

9. Angle of travel of the two speeds calculated using trigonometry or calculated by the software



10. Use velocities to find the initial and final momentums in both the horizontal and vertical plane and show if momentum is conserved in the two collisions

Horizontal Plane: $m_1U_{x1} + m_2U_{x2} = m_1V_{x1} + m_2V_{x2}$

Vertical Plane: $m_1U_{y1} + m_2U_{y2} = m_1V_{y1} + m_2V_{y2}$

Safety

- Low energy collisions used, no major hazard.

Notes

- Uncertainty in velocity comes from half the range of repeat readings.
- Friction cannot be accounted for in 2D.