

Edexcel Physics A Level

Core Practical 10

Use ICT to analyse Collisions between Small Spheres



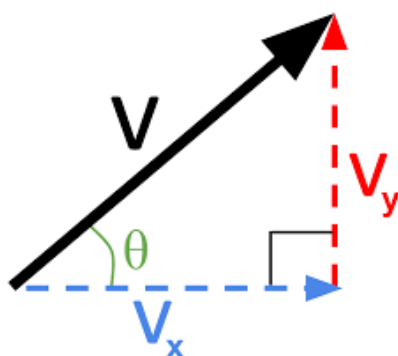
Method

- Record the **masses, m** , of the two spheres using a mass balance then place them on a level table top
- Position **two metre rulers** perpendicular to each other using a **set square**
- Position a **video camera** above the table top (bird's eye view) and start camera recording
- Roll one sphere towards **stationary sphere** and allow them to collide and roll
- Stop recording when both spheres come to rest
- Import video** to **tracking software**, and **calibrate** distance and a 90° angle using the metre rulers
- Go through each **frame** of the video, use the rulers to calculate the distance travelled and calculate the time between each frame
- 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

- Angle of travel** of the two speeds calculated using trigonometry or calculated by the software



- 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

$$\text{Horizontal Plane: } m_1 U_{x1} + m_2 U_{x2} = m_1 V_{x1} + m_2 V_{x2}$$

$$\text{Vertical Plane: } m_1 U_{y1} + m_2 U_{y2} = m_1 V_{y1} + m_2 V_{y2}$$

Safety

- Low energy collisions used, no major hazard

Evaluation

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

