MEASUREMENT OF THE DENSITY OF SOLIDS

Specification reference:	**AS Component**	**1.1 - Basic Physics**
	A level Component	**1.1 - Basic Physics**

Theory:

The density of regularly shaped solids can be determined by measuring their mass, m, and calculating their volume, V. The density, ρ, can then be found using:

$$\rho = \frac{m}{V}$$

Apparatus:

Various regularly shaped solids both rectangular and circular
30 cm ruler (resolution ± 0.1 cm)
Vernier calipers / micrometer (resolution ± 0.01 mm)
Balance (resolution ± 0.1 g / 1 g)

Further guidance for technicians:

Possible objects to include could be steel ball bearings of various sizes, an optical glass / perspex block, blocks of various metals, wood, polystyrene sphere etc

Experimental Method:

Determine the mass of the object using the balance. The volume of a rectangle can be found by measuring the length, l, width, w, and height, h. Calculate the volume, V using: $V = l \times w \times h$. The volume of a sphere is found by measuring the diameter to find the radius, r, and then calculate the volume using: $V = \frac{4}{3}\pi r^3$.
In both cases calculate the density using: $\rho = m/V$.

Extension:

This is an excellent opportunity to introduce the concept of uncertainty to the students.
This could be extended to determine the density of irregular objects by putting them in water and measuring the volume of water displaced.

Practical Techniques:

- Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.

Relevant previous practical past papers:

- PH3 2008 Q3
- PH3 2012 Task A1
- PH3 2013 Task A1