

**Making measurements and analysing data – 2021/20 GCE AS Physics A****1. Nov/2021/Paper\_156/01/No.22**

A student is determining the acceleration of free fall  $g$  using a metal sphere on a ramp. The sphere is released from the ramp at different heights. The speed  $v$  of the sphere at the bottom of the ramp is determined.

The acceleration of free fall  $g$  is given by the expression  $g = \frac{v^2}{2d}$ , where  $d$  is the initial height of the sphere and  $v$  is speed of the sphere at the bottom of the ramp.

The student records the following data.

- $d = 0.100 \pm 0.002 \text{ m}$
- $v = 1.4 \pm 0.1 \text{ ms}^{-1}$

(a) Name the instrument the student should use to measure  $d$ .

..... [1]

(b) Calculate the absolute uncertainty in  $g$ . Write your answer to **2** significant figures.

absolute uncertainty = .....  $\text{ms}^{-2}$  [3]

**2. Nov/2020/Paper\_156/01/No.22**

A toy parachute is falling through air.

The air resistance  $F$  acting on the parachute is given by the expression

$$F = kv^2$$

where  $v$  is the speed of the parachute and  $k$  is a constant.

(a) The S.I. base units for  $F$  are  $\text{kg m s}^{-2}$ .

Show that the S.I. base units for  $k$  are  $\text{kg m}^{-1}$ .

[2]

(b) The following items of data are collected for the parachute.

- $v = 1.20 \pm 0.12 \text{ m s}^{-1}$
- $F = 4.00 \pm 0.24 \text{ N}$

Calculate the absolute uncertainty in  $k$ . Write your answer to 2 significant figures.

absolute uncertainty in  $k = \dots\dots\dots \text{kg m}^{-1}$  [3]