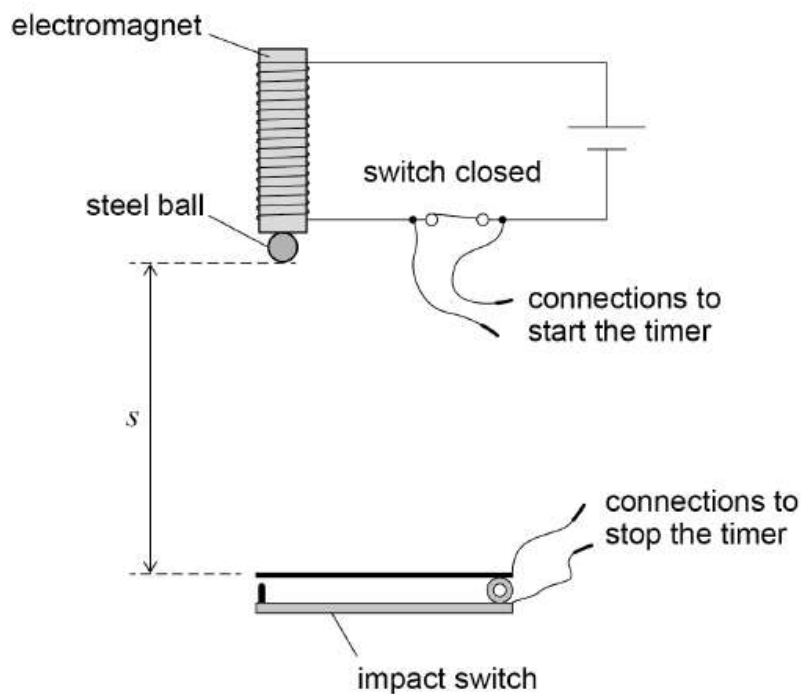


Measurements and their errors – AS Physics

1. No.1

0	1
---	---

Figure 1 shows apparatus used to determine the acceleration g due to gravity by a free-fall method.

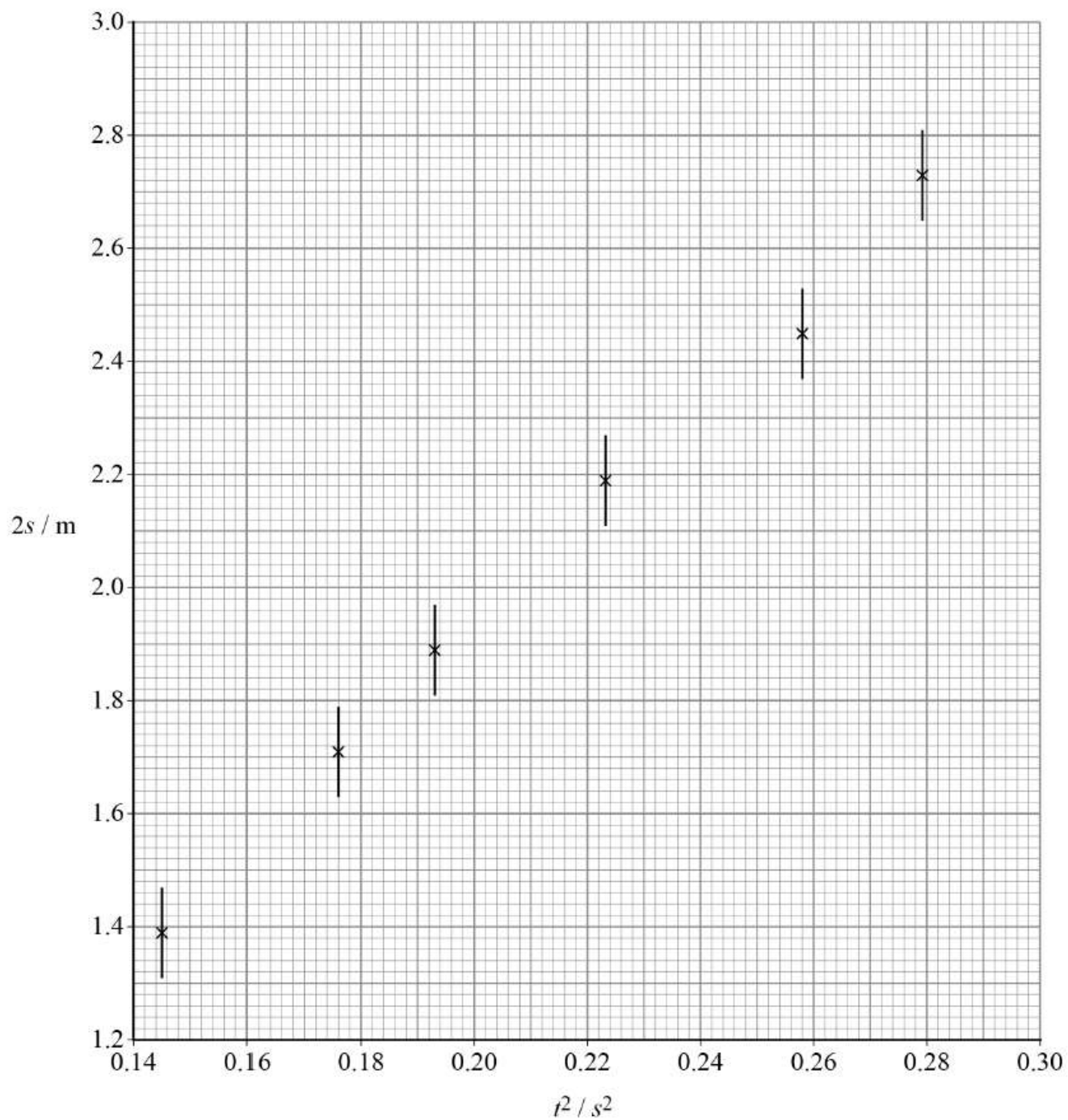
Figure 1

When the switch is opened a timer starts and a steel ball is released from rest. The ball falls vertically onto an impact switch and this stops the timer. The timer displays the time t for the ball to fall through the vertical distance s shown in **Figure 1**.

A student obtains values of t for different values of s .

The student plots the graph of $2s$ against t^2 shown in **Figure 2**.

Figure 2



0 1 . 1

The student has used an absolute uncertainty in s to draw the vertical error bars in **Figure 2**.

Deduce the student's absolute uncertainty in s .

[1 mark]

absolute uncertainty in $s =$ _____ m

0 1 . 2

Determine

- the maximum gradient $G_{\max}$ of a straight line that passes through all the error bars
- the minimum gradient $G_{\min}$ of a straight line that passes through all the error bars.

[3 marks]

$G_{\max} =$ _____

$G_{\min} =$ _____

0 1 . 3 It can be shown that $2s = gt^2$.

Determine a value for g using $G_{\max}$ and $G_{\min}$.

[2 marks]

$g =$ _____ m s^{-2}

0 1 . 4 Determine the percentage uncertainty in your value for g .

[2 marks]

percentage uncertainty = _____ %

A fault develops in the apparatus.

When the switch is opened there is now a 30 ms delay before the ball is released.

0 1 . 5

State the type of error produced by this fault.

[1 mark]

0 1 . 6

A graph of $2s$ against t^2 is produced using results from the faulty apparatus.

Describe how this graph is different from the graph in **Figure 2**.

[1 mark]

2. No.7

Which row only contains SI fundamental base units?

[1 mark]

A A, kg, N, s

☐

B A, K, mol, s

☐

C C, kg, m, mol

☐

D J, K, m, s

☐

3. No.21

Which is a scalar quantity?

[1 mark]

A force

☐

B kinetic energy

☐

C momentum

☐

D velocity

☐