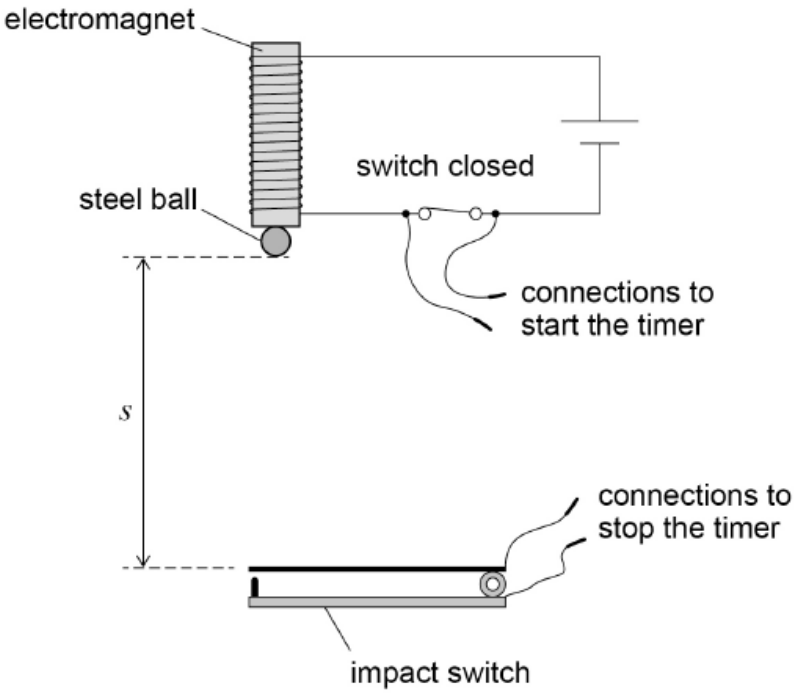
Measurements and theirs errors – 2022 AS Physics

1. June /2022/Paper_ 7407/2/No.1

0	1

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

Figure 1

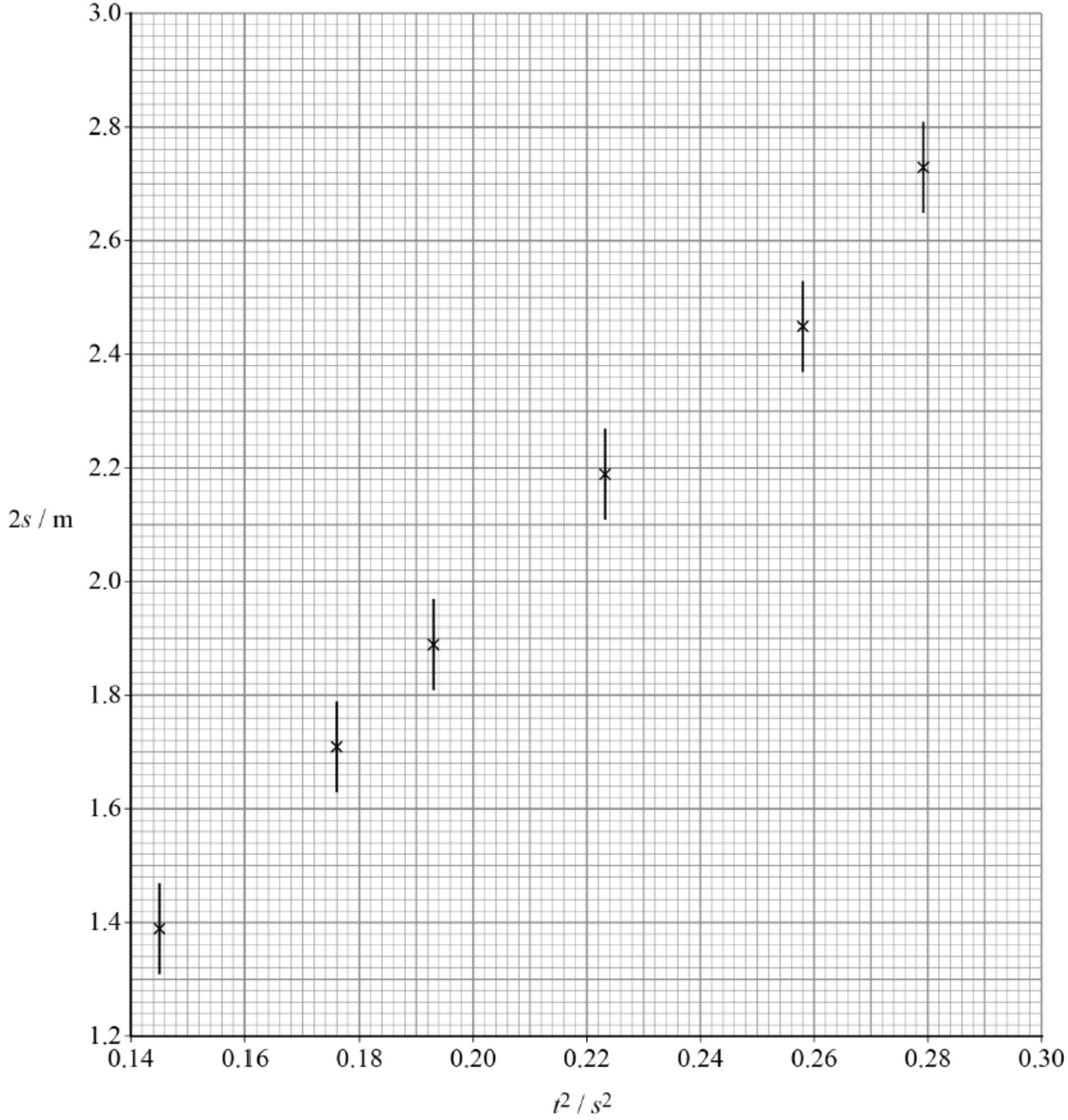


When the switch is opened a timer starts and a steel ball is released from rest.
The ball falls vertically onto an impact switch and this stops the timer.
The timer displays the time t for the ball to fall through the vertical distance s shown in **Figure 1**.

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. June /2022/Paper_ 7407/2/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. June /2022/Paper_ 7407/2/No.21

Which is a scalar quantity?

[1 mark]

A force ⬭

B kinetic energy ⬭

C momentum ⬭

D velocity ⬭