Measurement of g by freefall

Specification reference: AS Unit 1.2 — Kinematics

THEORY

An equation of motion can be used to calculate the acceleration due to gravity, g.

$$s = ut + \tfrac{1}{2}at^2$$

Where: u = initial velocity = 0,

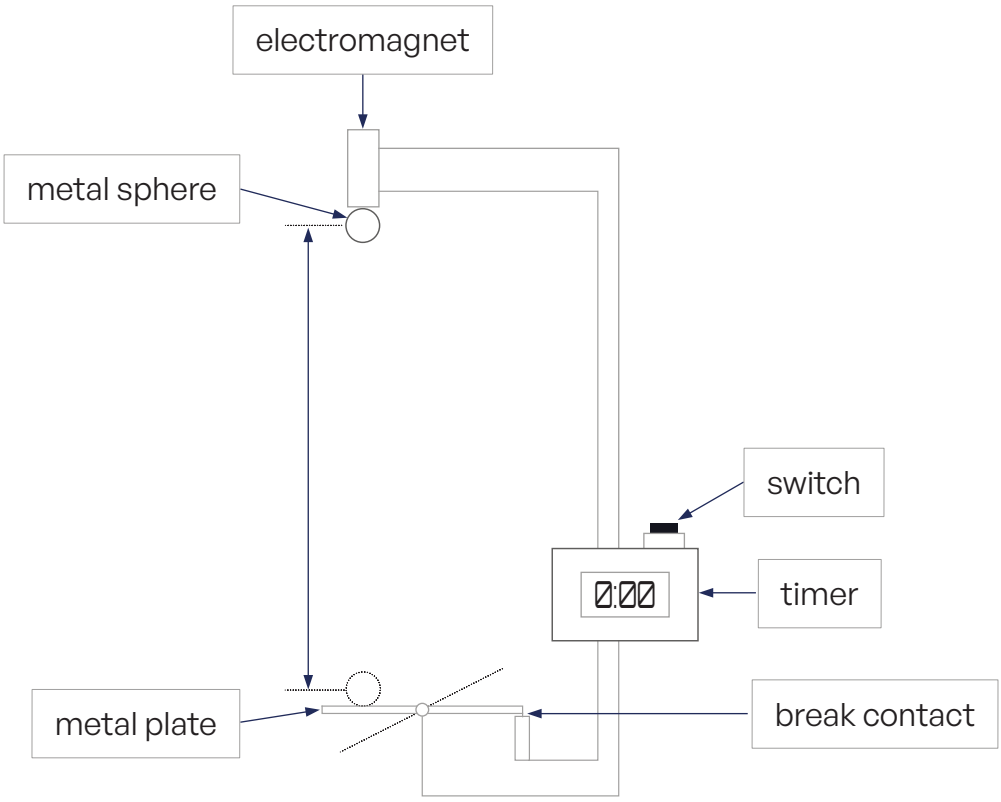
s = height, h and

a = acceleration due to gravity, g

This gives $h = \tfrac{1}{2}gt^2$

If a graph of height, h, (y-axis) is plotted against time squared, t^2, (x-axis) the gradient will equal $g/2$, or $g = 2 \times$ gradient.

APPARATUS



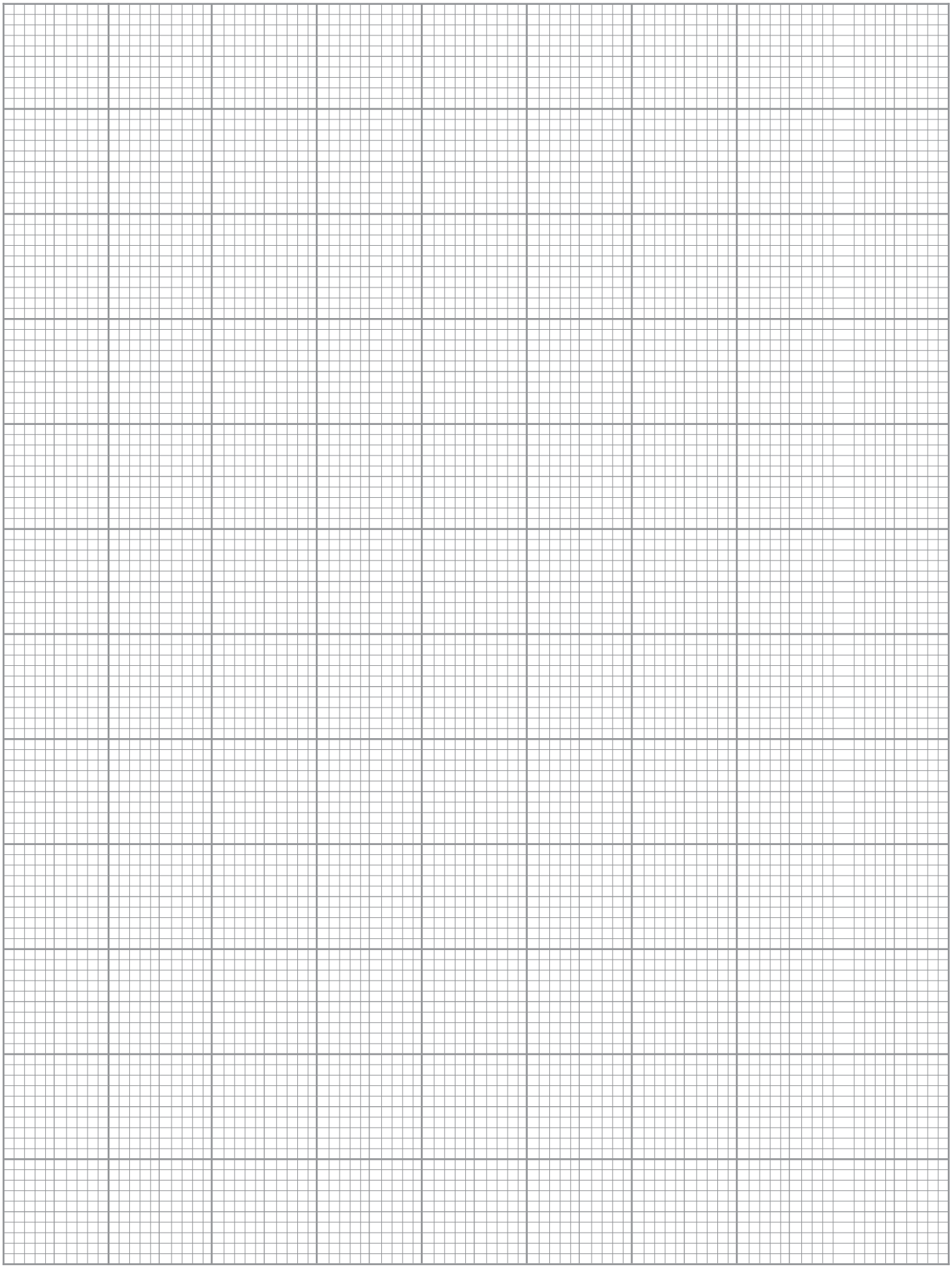
EXPERIMENTAL METHOD

When the switch is pressed it disconnects the electromagnet releasing the metal sphere. At the same instant the timer starts. When the sphere hits the magnetic switch it breaks the circuit stopping the timer, thus recording the time it takes for the sphere to fall through a height, h. The time taken for the ball bearing to fall through a range of different heights needs to be measured. Plot a graph of height, h, (y-axis) against time squared, t^2, (x-axis) and calculate the value of g using: $g = 2 \times$ gradient.

SPACE FOR NOTES

TABLE OF RESULTS

GRAPH



QUESTIONS

1. Suggest why your obtained value of g may not be the same as the accepted value.

2. What is the advantage of using an electronic system over a stop-clock in this experiment?

3. How could your results be improved?

4. How should you calculate the uncertainty in your time readings?

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