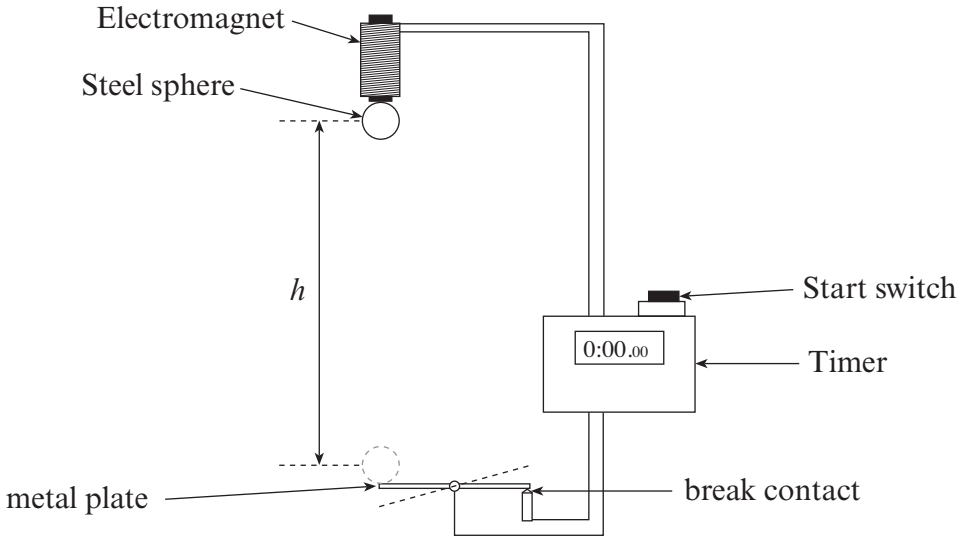
Data analysis task

Several Physics students carry out an experiment to measure the acceleration due to gravity, g, by measuring the time it takes for a steel sphere to fall and break an electrical contact. The following apparatus is used.



When the "Start switch" is pressed it disconnects the electromagnet, releasing the steel sphere. At the same instant the timer starts. When the sphere hits the metal plate it breaks the circuit, stopping the timer, which therefore records the time, t, it takes for the sphere to fall through the height, h.

The students repeat this procedure for a range of heights. The results are shown in the table below.

Height, h ± 0.01	Time, t ± 0.01	Time Squared, t^2 ± 5%	Absolute uncertainty in t^2
(m)	(s)	**(s^2)**	**(s^2)**
1.00	0.44	***0.19 (4)***	***0.01 (0)***
1.20	0.49	***0.24 (0)***	***0.01 (2)***
1.40	0.52	***0.27 (0)***	***0.01 (4)***
1.60	0.56	***0.31 (4)***	***0.01 (6)***
1.80	0.60	***0.36 (0)***	***0.01 (8)***
2.00	0.64	***0.41 (0)***	***0.02 (1)***
2.20	0.67	***0.44 (9)***	***0.02 (2)***
2.40	0.70	***0.49 (0)***	***0.02 (5)***

(a) Complete the two columns for time squared, (t^2) and absolute uncertainty in t^2. Include units at the top of each column. [4]

See answers in table
Units correct [s^2 in both t and Δt^2] (1)
all t^2 calculated correctly (1)
t^2 quoted to 2 or 3 d.p. (1)
Uncertainties calculated correctly and expressed to 1 s.f. [accept 2 s.f.] (1)