AS Level Physics A

H156/02 Depth in physics

Question Set 9

1 A student is carrying out an experiment in the laboratory to determine the acceleration of free fall *g*. The student drops a small steel ball from rest and records the time *t* taken for the ball to fall through a vertical distance *h*.

The results for different vertical distances are shown in the table below.

h / m	t / s	t^2 / s^2
0.660	0.365	0.133
0.720	0.385	0.148
0.780	0.400	0.160
0.840	0.415	0.172
0.900	0.430	
0.960	0.445	0.198

(a) Describe and explain how the student could use standard laboratory equipment to make accurate measurements of *h* and *t*.

[4]

(b) Complete the table for the missing value of t^2

[1]

(c) Fig. 3 shows the graph of t^2 (*y*-axis) against *h* (*x*-axis).

(i) Plot the missing data point and draw the straight line of best fit.

[2]

(ii) Determine the gradient of the straight line of best fit.

gradient = ...

[1]

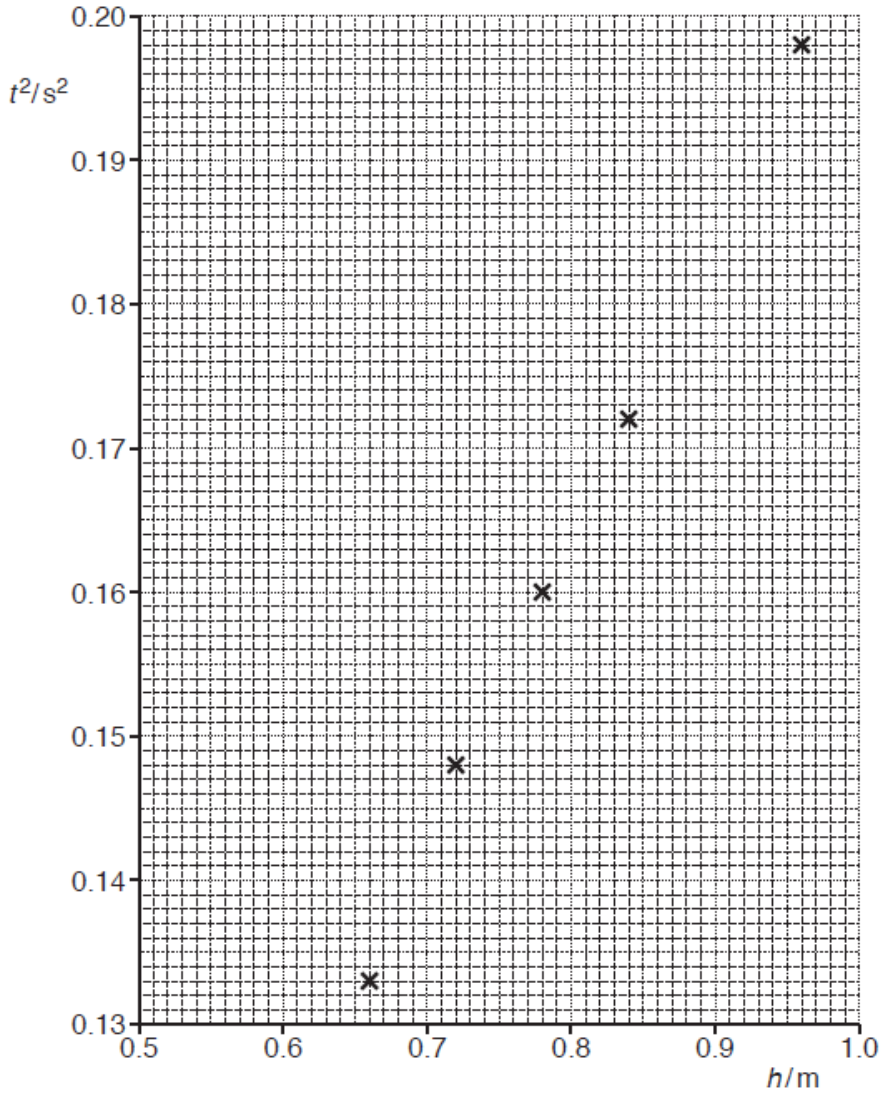

Fig. 3

(d) **(i)** Use the equations of motion for constant acceleration to show that the relationship between t and h is

$$t^2 = \left(\frac{2}{g}\right)h$$

where g is the acceleration of free fall.

[1]

(ii) Use your answer to **(c)(ii)** to determine the experimental value for g.

g = ... $m\,s^{-2}$

[1]

Total Marks for Question Set 9: 10

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