SMART EXAM RESOURCES
IGCSE PHYSICS
ATP- TOPIC QUESTIONS+MARKSCHEMES
DIMENSIONS OF A BOILING TUBE

1 A student investigates the dimensions of a boiling tube.
She uses the apparatus shown in Fig. 1.1.

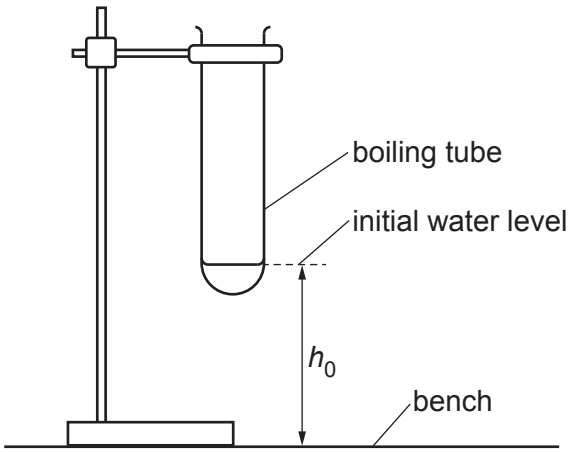


Fig. 1.1

(a) The student pours a small amount of water into the boiling tube and measures the height h_0 from the bench to the initial water level.

h_0 = 2.6 ..... cm

Suggest **one** precaution that is taken when measuring the height of the water level to ensure the reading is accurate.
You may draw a diagram if it helps your explanation.

.....

..... [1]

(b) The student uses a measuring cylinder graduated in cm^3 to add a volume of water $V = 5.0\,cm^3$ to the boiling tube.
Part of the boiling tube, after the water has been added, is shown full size in Fig. 1.2.

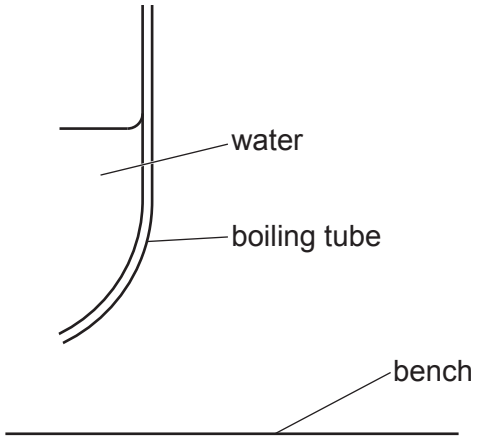


Fig. 1.2

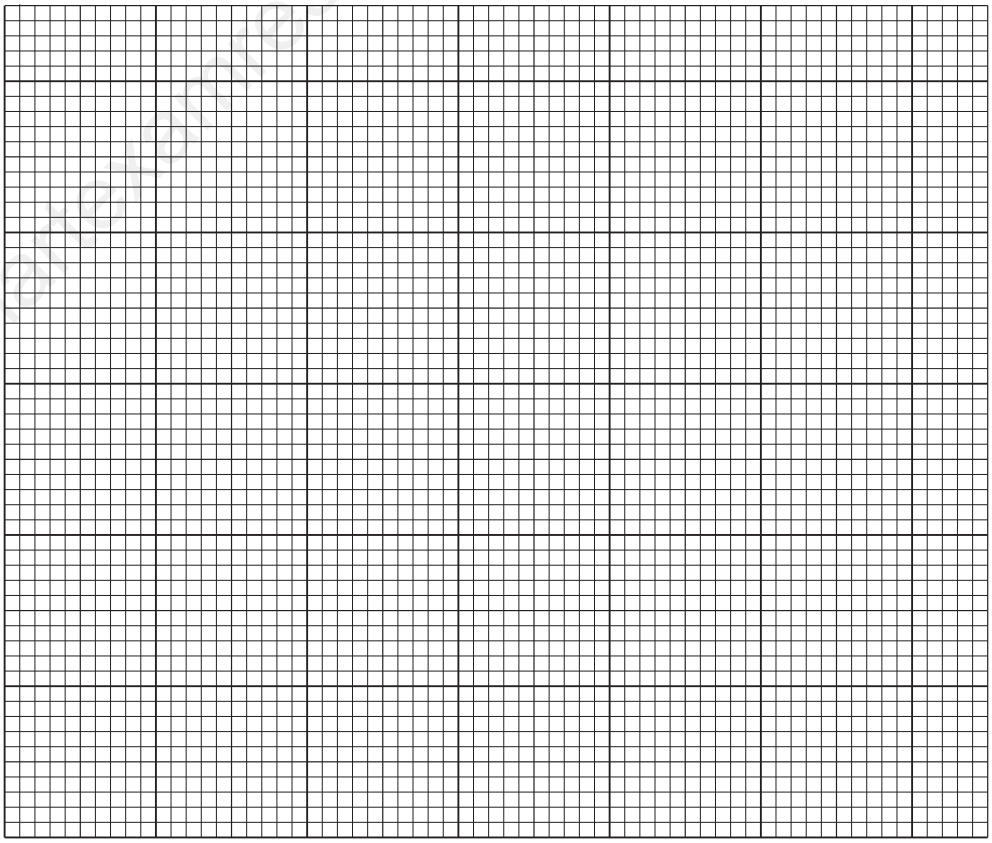
Measure, and record in the first row of Table 1.1, the new height h of the water level from the bench. [1]

Table 1.1

V / cm^3	h / cm	H / cm
5.0		
10.0	5.5	2.9
15.0	6.7	4.1
20.0	8.3	5.7
25.0	9.6	7.0

(c) For the value of $V = 5.0\,cm^3$, calculate, and record in Table 1.1, the increase in height H of the water in the boiling tube. Use the value of h_0 from **(a)**, your value of h in Table 1.1 and the equation $H = (h - h_0)$. [1]

(d) Plot a graph of V/cm^3 (y-axis) against H/cm (x-axis).



[4]

(e) **(i)** Determine the gradient of the graph. Show clearly on the graph how you obtained the necessary information.

gradient = ... [1]

(ii) Calculate D, the inside diameter of the boiling tube.

Use the equation $D = \sqrt{\frac{4G}{\pi}}$, where G is numerically equivalent to the gradient in **(e)(i)**.

D = ... cm [1]

(f) Suggest why it was important for the student to add a small volume of water at the start of the experiment.

.....

..... [1]

(g) Another student uses this experiment, with the same apparatus, to measure *D* for a small test-tube of diameter approximately 1.2 cm. He adds water in volumes of 1.0 cm^3 at a time. State and explain **one** reason why this is **not** an accurate method to use for this test-tube.

.....

..... [1]

[Total: 11]

MARK SCHEME:

Question	Answer	Marks
(a)	precaution for reading water level e.g.: view scale perpendicularly rule close to boiling tube use of set square	1
(b)	h = 4.0	1
(c)	H = 1.4 / ecf from **(b)**	1
(d)	axes labelled with quantity and unit	1
	appropriate scales (occupying at least ½ grid)	1
	plots all correct to ½ small square and precise plots	1
	well-judged line and thin line	1
(e)(i)	G present and triangle method shown on graph grid	1
(e)(ii)	D in range 1.9 cm to 2.4 cm	1
(f)	inside diameter near base not uniform / owtte	1
(g)	valid critical comment e.g.: water volumes small – large uncertainty in measuring cylinder test-tube diameter small – large uncertainty in answer / owtte height changes small so unreliable	1