1 A student is investigating the position of a sheet of card that is hanging from a pivot.
Fig. 2.1 shows the apparatus drawn full size.

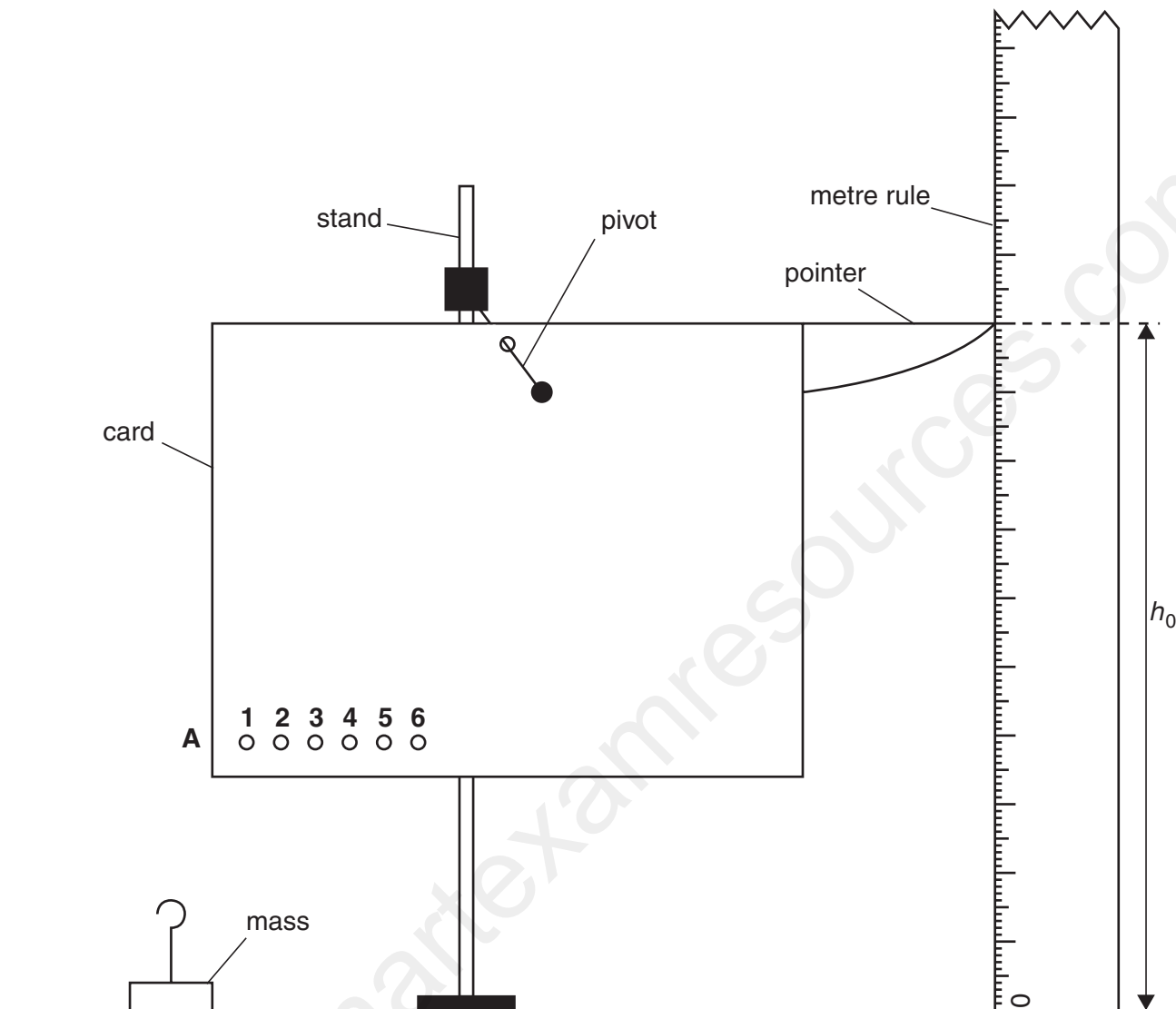
Fig. 2.1

(a) On Fig. 2.1 measure the distance d between the centre of the hole labelled **1** and the edge of the card at **A**. Record this value in the table.

hole	d/mm	h/mm	b/mm
1		140	
2		135	
3		132	
4		128	
5		124	
6		120	

[3]

(b) Repeat step **(a)** for each of the remaining holes **2 – 6**.

(c) On Fig. 2.1 measure the height h_0 of the pointer above the bench.

$$h_0 = \text{...}$$

[1]

(d) A student hangs a 10 g mass from the hole **1** in the card. She records the height h of the end of the pointer above the bench. She then repeats this procedure by hanging the mass from each hole in turn. Her results are shown in the table above.

(e) Calculate the differences in heights b using the equation

$$b = (h - h_0)$$

and record the results in the table above.

(f) Plot the graph of b/mm (y-axis) against d/mm (x-axis).

b/mm

45

40

35

30

25

20
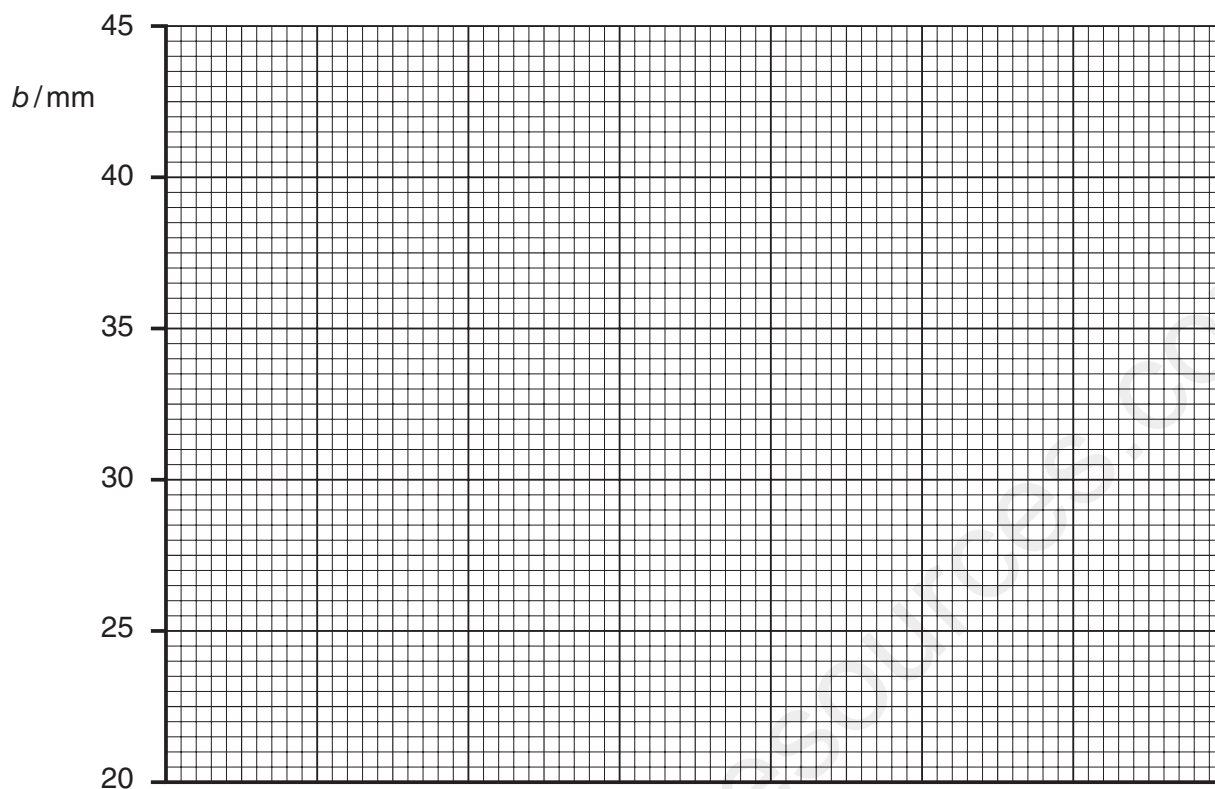
[4]

(g) The student suggests that b is directly proportional to d. By reference to your graph, state whether or not the results support the student's suggestion. Give a reason for your answer.

Statement ....

Reason ....

....

.... [2]

(h) It is important when recording the heights that the rule is vertical. State briefly how you would check that the rule is vertical.

....

.... [1]

[Total: 11]

(a) and **(b)** 6 d values [1]

correct values for d 5, 10, 15, 20, 25, 30 [1]

(c) h_0 = 100mm (including unit, cm/m allowed) [1]

(e) correct values for b 40, 35, 32, 28, 24, 20 (ecf) [1]

(f) Graph:
correct d axis labelled with symbol / unit [1]
plots to nearest ½ sq (-1 each error or omission) [2]
best fit straight line [1]
single line, thin and best fit [1]

(g) no
line not through origin
OR when b increases, d decreases
OR negative gradient [1]

(h) use of set square / protractor / spirit level / plumbline [1]

[Total: 11]