1 The IGCSE class is investigating the effect of a load on a metre rule attached to a forcemeter. The apparatus is shown in Fig. 1.1.

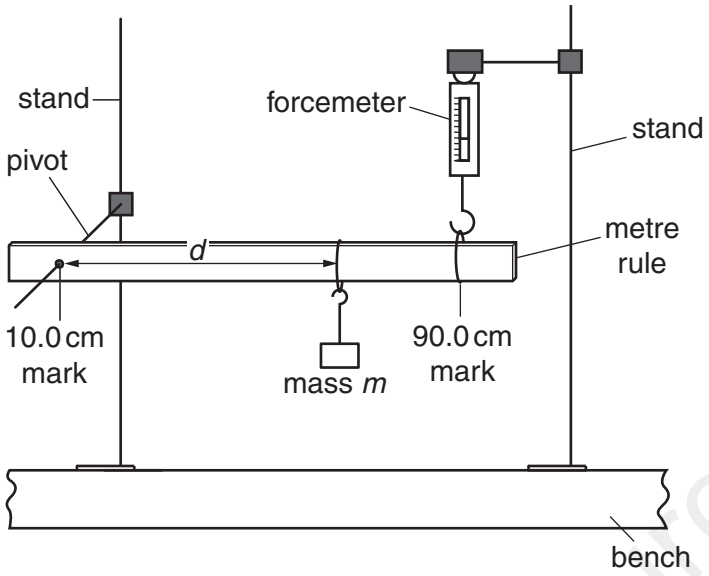

Fig. 1.1

The rule is pivoted near one end at the 10.0 cm mark. Near the other end, at the 90.0 cm mark, the rule is attached to a forcemeter. A mass is hanging from the rule at a distance *d* from the pivot.

(a) A student moves the mass to a distance *d* = 70.0 cm from the pivot. He adjusts the height of the forcemeter until the rule is again horizontal. He records the reading *F* on the forcemeter.

He repeats the procedure using *d* values of 60.0 cm, 50.0 cm, 40.0 cm, 30.0 cm, 20.0 cm and 10.0 cm. The forcemeter readings are shown in Table 1.1.

Table 1.1

d/	*F*/
	2.9
	2.5
	2.2
	1.8
	1.5
	1.2
	0.8

(i) Record the *d* values in the table.

(ii) Complete the column headings in the table. [2]

(b) The student thinks that F is directly proportional to d.

(i) Suggest the graph that you could plot to test this idea. You are not asked to plot the graph.

..... against .....

(ii) State the properties of the line that would indicate that F is directly proportional to d.

1. .....

2. .....

[3]

(c) A spirit level is a piece of equipment that is placed on a surface to check whether the surface is horizontal.

Suggest why a spirit level balanced on the rule is not suitable for checking whether the rule is horizontal in this experiment.

.....

.....[1]

(d) Describe briefly how you would check that the rule is horizontal in this experiment. You may draw a diagram.

.....

.....

.....[1]

[Total: 7]

(a) Table:
correct *d* values
70.0, 60.0, 50.0, 40.0, 30.0, 20.0, 10.0 [1]
cm, N ALLOW m, mm if consistent with figures [1]

(b) **(i)** *d* against *F* (or vice versa) OR distance against force/forcemeter reading
NOT 'extension', 'forcemeter', quantity expressed just as units [1]

(ii) Straight line [1]
Through origin or wtte [1]

(c) Would change forcemeter reading/change mass on rule/wtte [1]

(d) Check distance from bench is the same at two points or wtte/
Line up by eye with windowsill (or suitable horizontal reference) [1]

[Total: 7]