1 Figure 10 shows two students investigating reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can with his left hand.

The investigation is repeated with the right hand of student B.

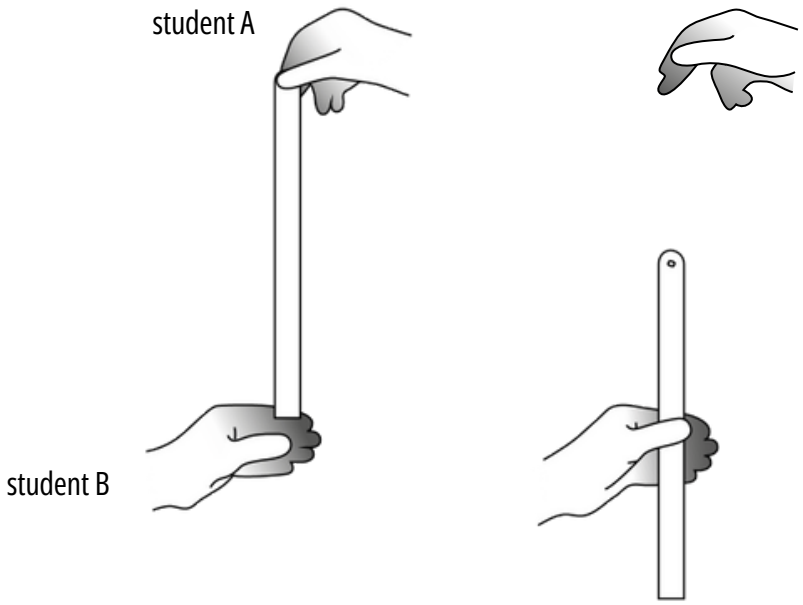


Figure 10

(a)Give a reason why it is better to have the 0 cm mark at the bottom of the ruler rather than at the top.

(1)

.....

.....

(b)Give a reason why two students are needed for this investigation.

(1)

.....

.....

(c)The students took five results for the left hand and five results for the right hand.

Figure 11 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	.....

Figure 11

(i) Calculate the average distance dropped for the right hand. Give your answer correct to 2 significant figures.

(2)

distance = ... cm

(ii)Calculate the average time for the left hand.

Use the equation

$$\text{time} = \left(\frac{\text{distance}}{500}\right)^2$$

(2)

average time = ... s

(d)Explain whether any of the readings are anomalous.

(2)

(e)Give **two** ways that the students can improve the quality of their data, other than ignoring anomalous results.

(2)

1

2

(f) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

(Total for Question = 12 marks)

2 A student uses a digital calliper to measure the length of a spring as shown inFigure 20.

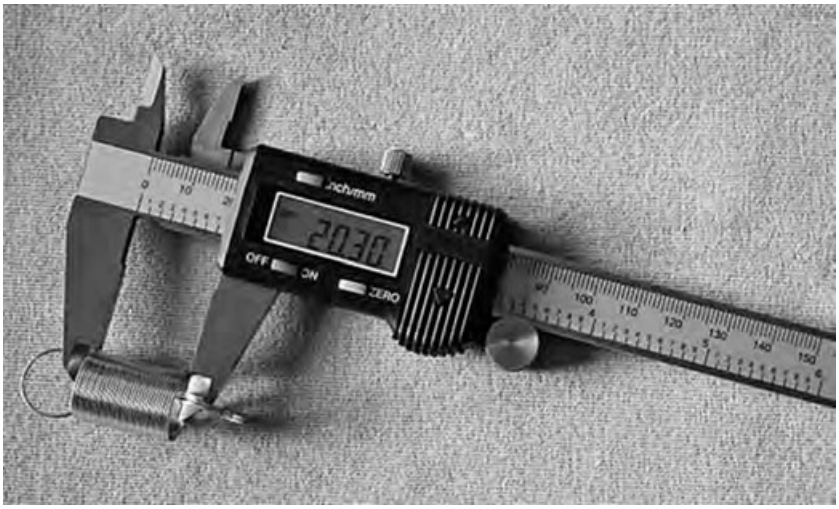


Figure 20

The spring is bendy and difficult to measure.

The student takes the six readings shown in Figure 21.

Figure 21

(a)Calculate the average length of the spring.

(2)

average length = ... mm

(b)The student investigates the stretching of a spring with the equipment shown in Figure 22.

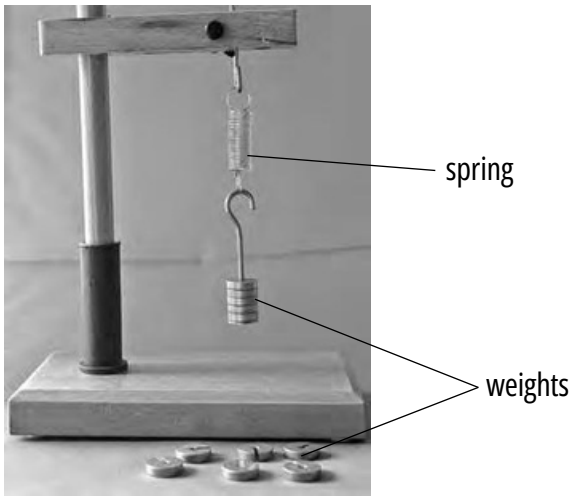


Figure 22

The student investigates the extension of the spring using six different weights.

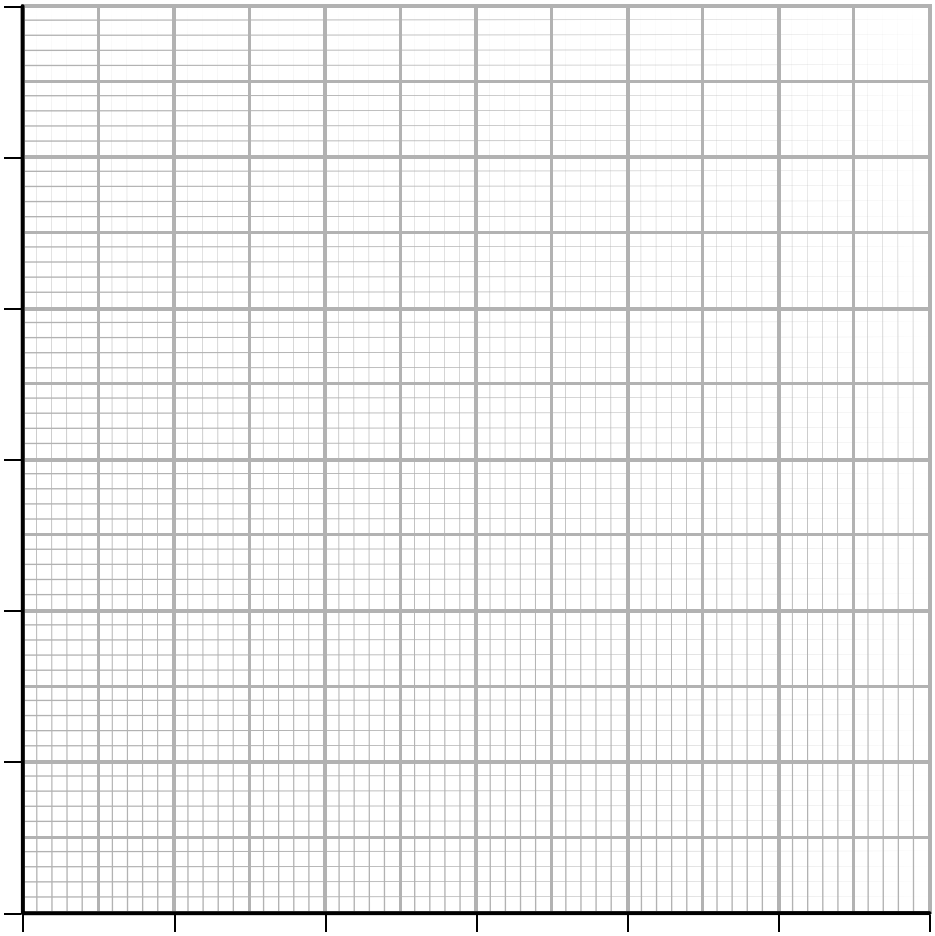
The results are shown in Figure 23.

weight (N)	extension (mm)
0.20	4.0
0.40	8.0
0.60	12.0
0.80	16.0
1.00	20.0
1.20	24.0

Figure 23

(i)Draw a graph for the readings, using the grid shown.

(3)



(ii)The student writes this conclusion:

'*The extension of the spring is directly proportional to the weight stretching the spring*.'

Comment on the student's conclusion.

(3)

(c)The student extends the investigation by finding information about the stretching of wires.

The student finds the graph shown in Figure 24 for the stretching of a wire.

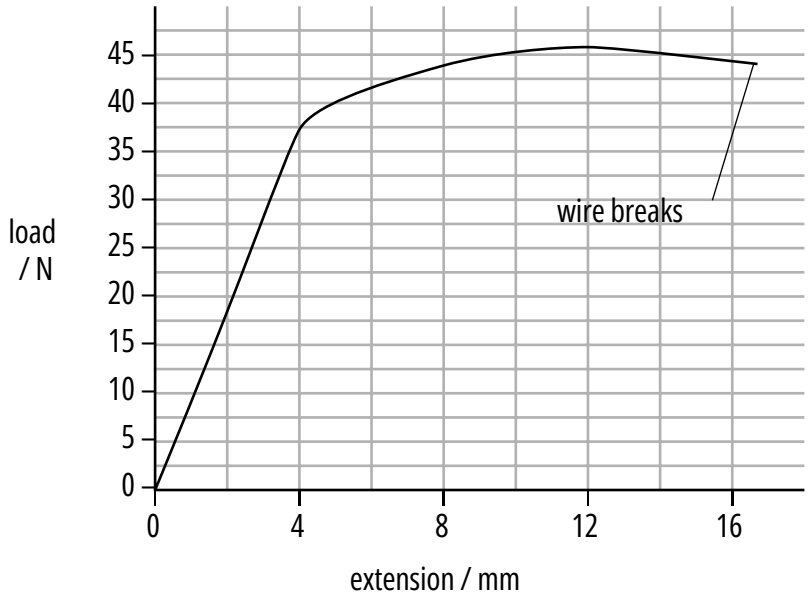


Figure 24

Describe the non-linear stretching of the wire shown in Figure 24.

(3)

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.....

(Total for Question = 11 marks)