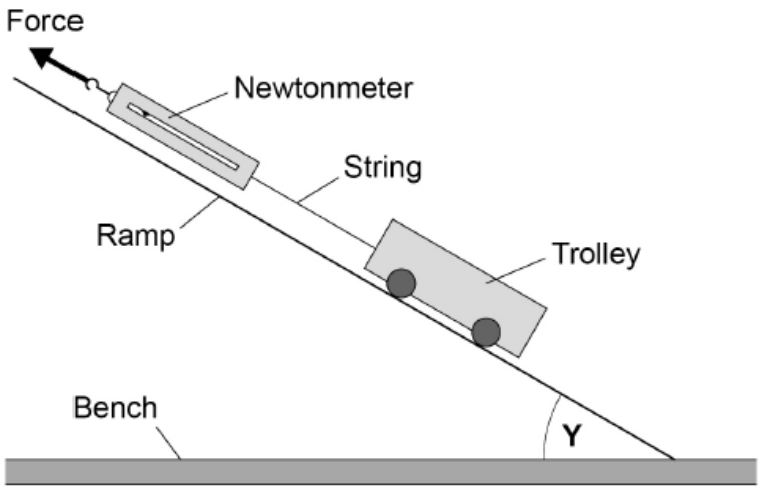
Force and elasticity – GCSE Physics Paper 2

1. No.4(4.1_4.5)

0 4 A student investigated how the angle of a ramp affects the force required to hold a trolley stationary on the ramp.

Figure 10 shows the equipment used.

Figure 10



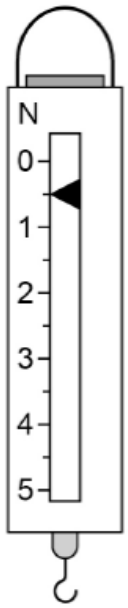
0 4 . 1 Measure the angle **Y** in **Figure 10**

[1 mark]

Angle **Y** = _____ degrees

Figure 11 shows the newtonmeter before the investigation started.

Figure 11



0 4 . 2 What type of error is shown on the newtonmeter in **Figure 11**?

[1 mark]

Tick (✓) **one** box.

Human error ☐

Random error ☐

Zero error ☐

0 4 . 3 How can this error be corrected after the measurements have been taken?

[1 mark]

Tick (✓) **one** box.

Add 0.5 N to each measurement ☐

Multiply each measurement by 0.5 N ☐

Subtract 0.5 N from each measurement ☐

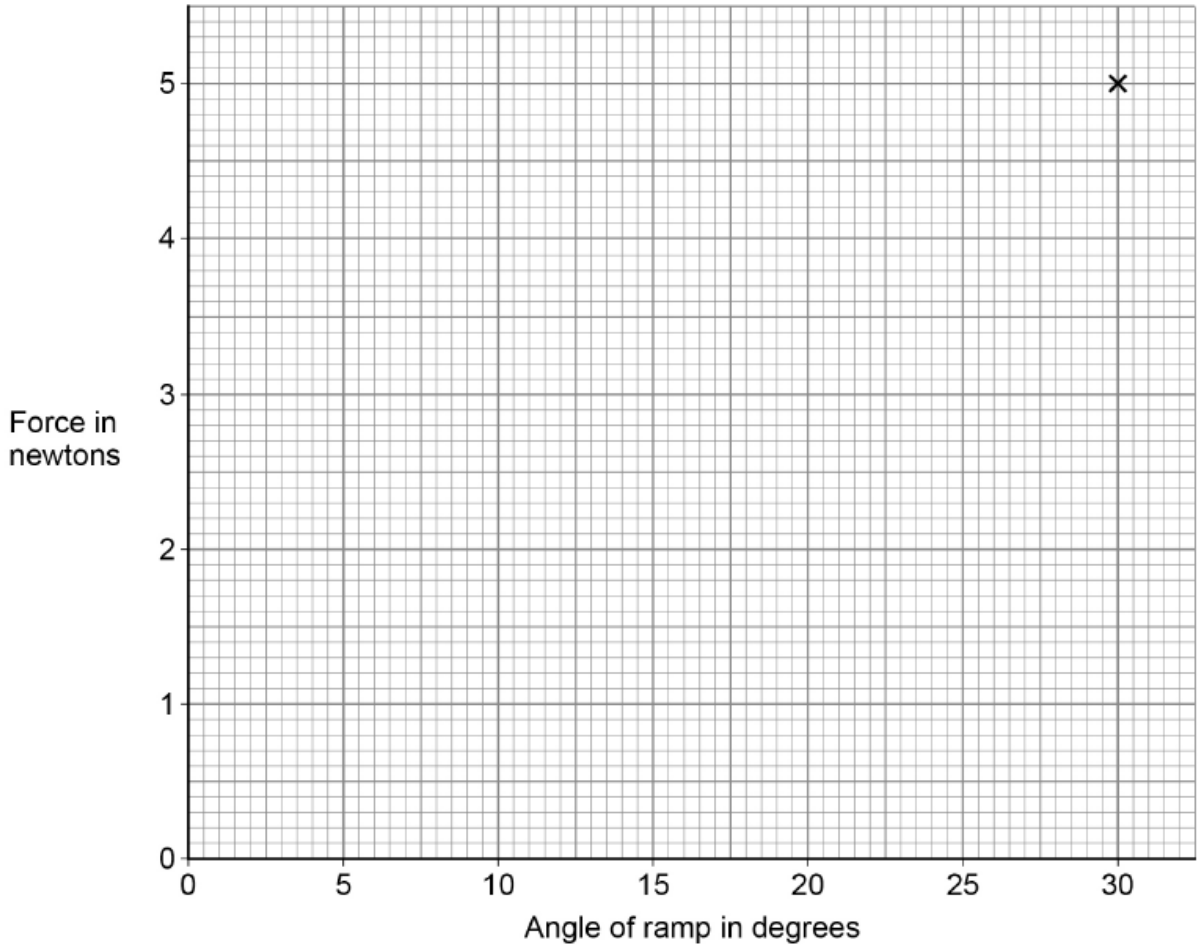
Table 2 shows the corrected results.

Table 2

Angle of ramp in degrees	Force in newtons
5	0.9
10	1.7
15	2.6
20	3.4
25	4.2
30	5.0

Figure 12 is an incomplete graph of the results

Figure 12

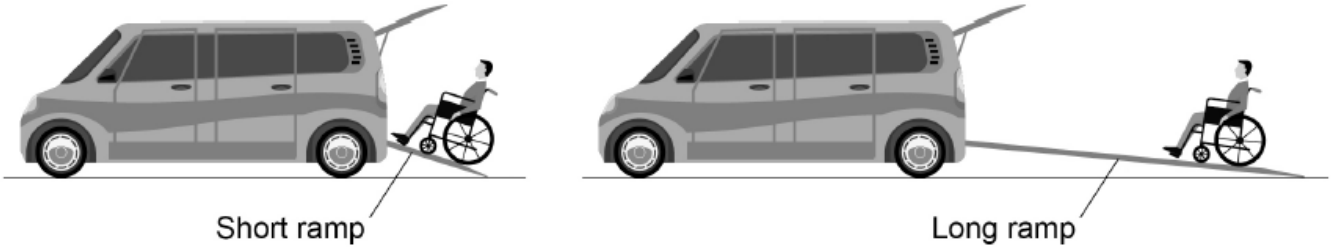


0 4 . 4 Plot the missing results from **Table 2** on **Figure 12**.

[2 marks]

0 4 . 5 **Figure 13** shows a person in a wheelchair using two different ramps to enter a van.

Figure 13



The ramps are at different angles to the ground.

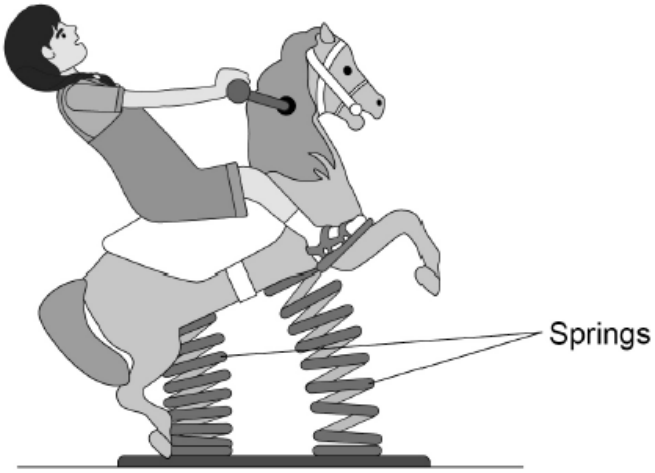
Explain **one** advantage of using the long ramp compared with using the short ramp.

[2 marks]

2. No.9

0 9 **Figure 20** shows a child on a playground toy.

Figure 20



0 9 . 1 The springs have been elastically deformed.

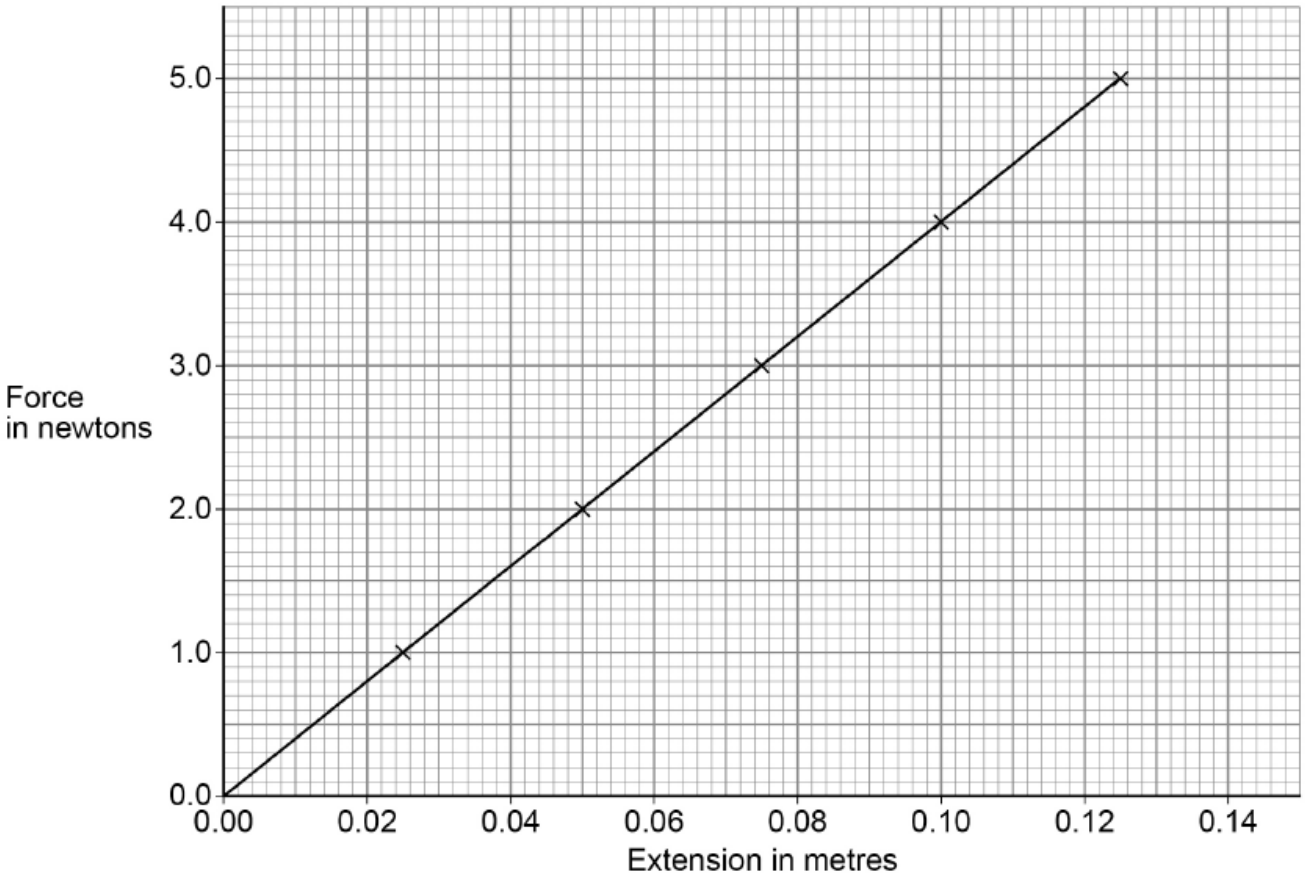
Explain what is meant by 'elastically deformed'.

[2 marks]

A student investigated the relationship between the force applied to a spring and the extension of the spring.

Figure 21 shows the results.

Figure 21



0 9 . 2 Describe a method the student could use to obtain the results given in **Figure 21**.

You should include a risk assessment for **one** hazard in the investigation.

Your answer may include a diagram.

[6 marks]

0 9 . 3 Which equation links extension (e), force (F) and spring constant (k).

[1 mark]

Tick (✓) **one** box.

force = spring constant × (extension)^2 ☐

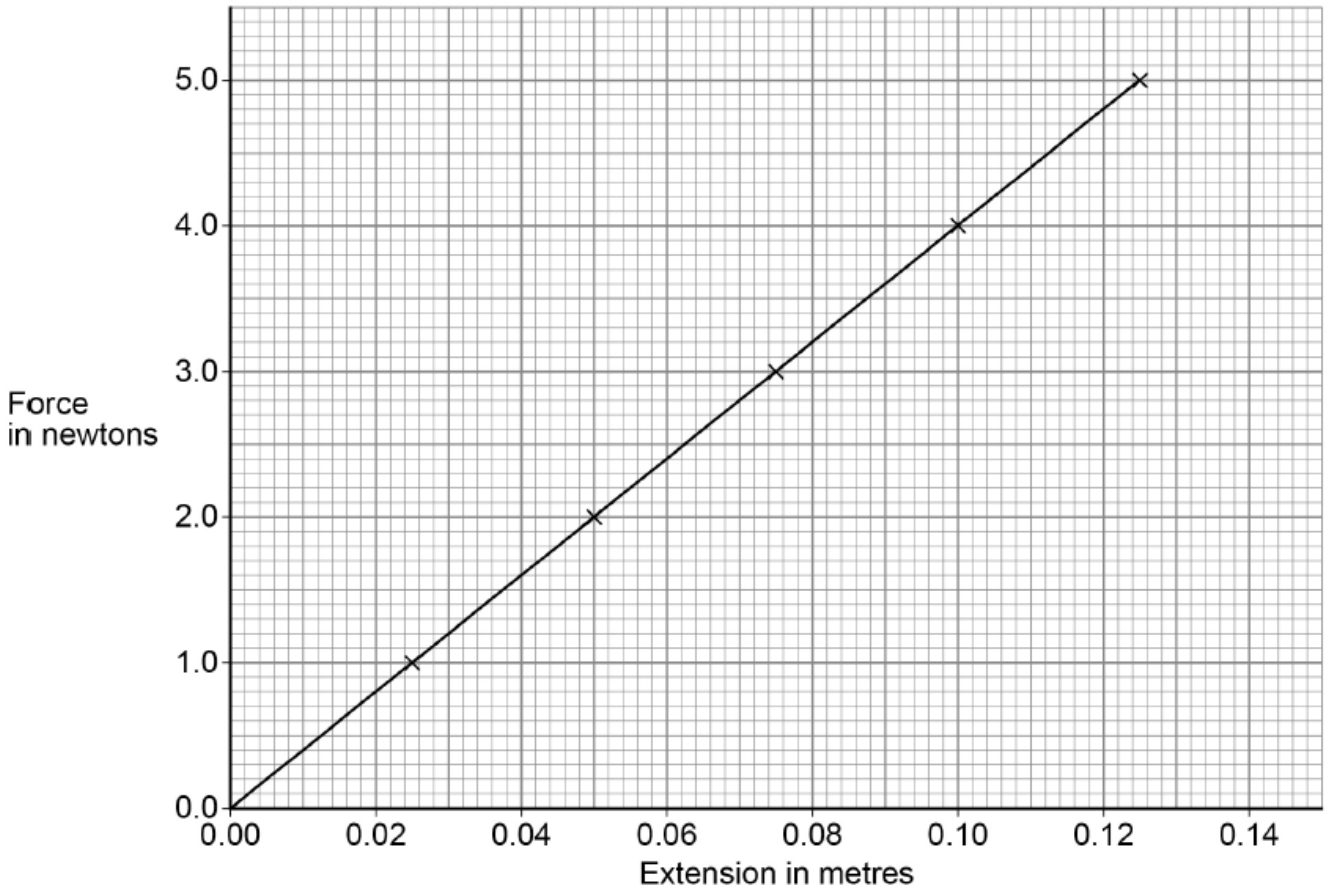
force = spring constant × extension ☐

force = $\frac{\text{extension}}{\text{spring constant}}$ ☐

force = $\frac{\text{spring constant}}{\text{extension}}$ ☐

Figure 21 is repeated below.

Figure 21



0 9 . 4 Determine the spring constant of the spring.

Use **Figure 21**.

[3 marks]

Spring constant = _____ N/m

0 9 . 5 The student concluded:

'The extension of the spring is directly proportional to the force applied to the spring.'

Describe how **Figure 21** supports the student's conclusion.

[2 marks]

0 9 . 6 The student repeated the investigation using a different spring with a spring constant of 13 N/m.

Calculate the elastic potential energy of the spring when the extension of the spring was 20 cm.

Use the Physics Equations Sheet.

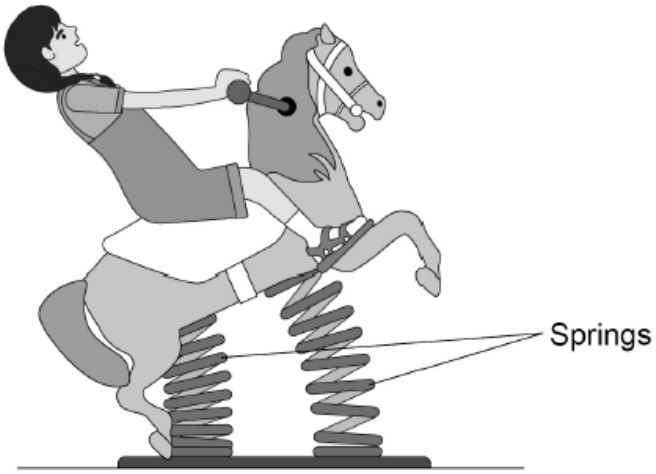
[3 marks]

Elastic potential energy = _____ J

3. No.2

0 2 **Figure 3** shows a child on a playground toy.

Figure 3



0 2 . 1 The springs have been elastically deformed.

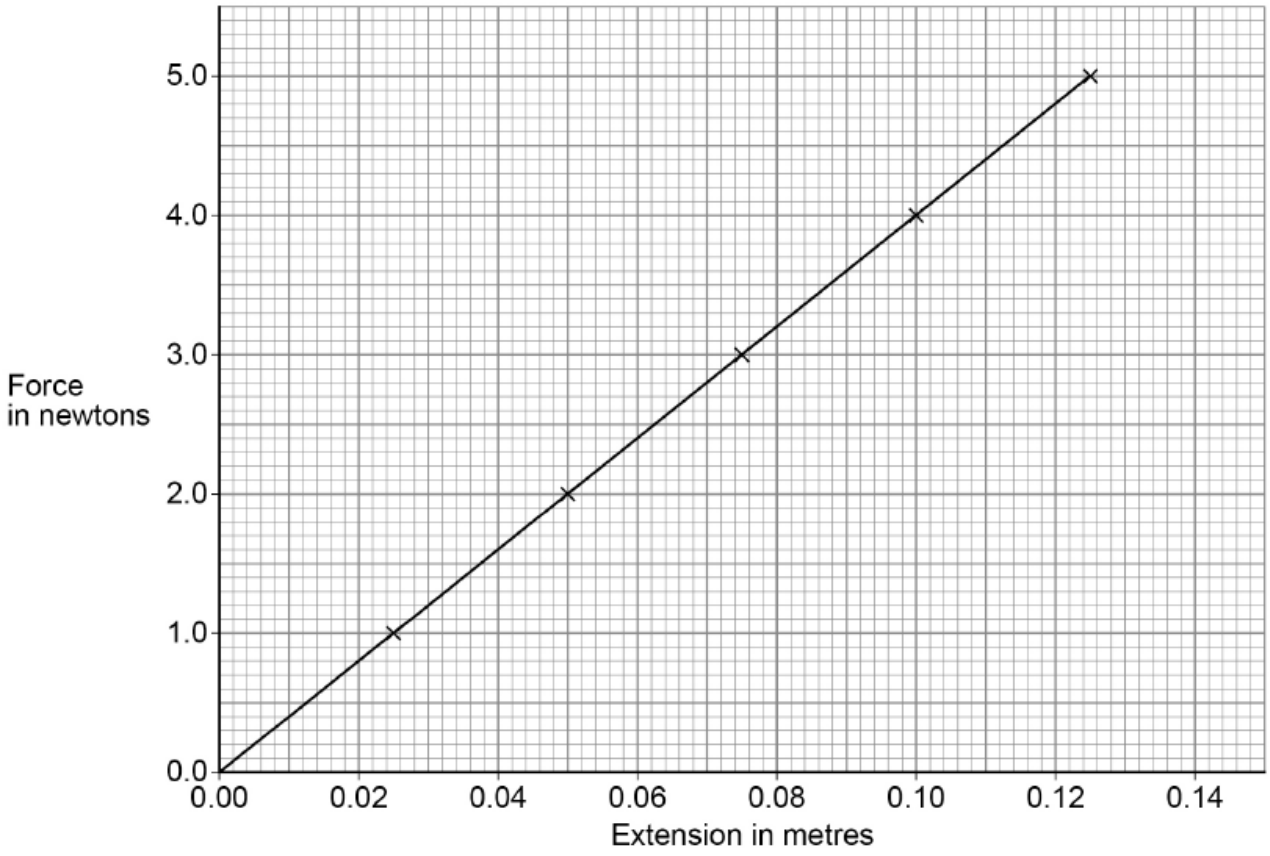
Explain what is meant by 'elastically deformed'.

[2 marks]

A student investigated the relationship between the force applied to a spring and the extension of the spring.

Figure 4 shows the results.

Figure 4



0 2 . 2 Describe a method the student could use to obtain the results given in **Figure 4**.

You should include a risk assessment for **one** hazard in the investigation.

Your answer may include a diagram.

[6 marks]

0 2 . 3 Which equation links extension (e), force (F) and spring constant (k).

[1 mark]

Tick (✓) **one** box.

force = spring constant × (extension)^2 ☐

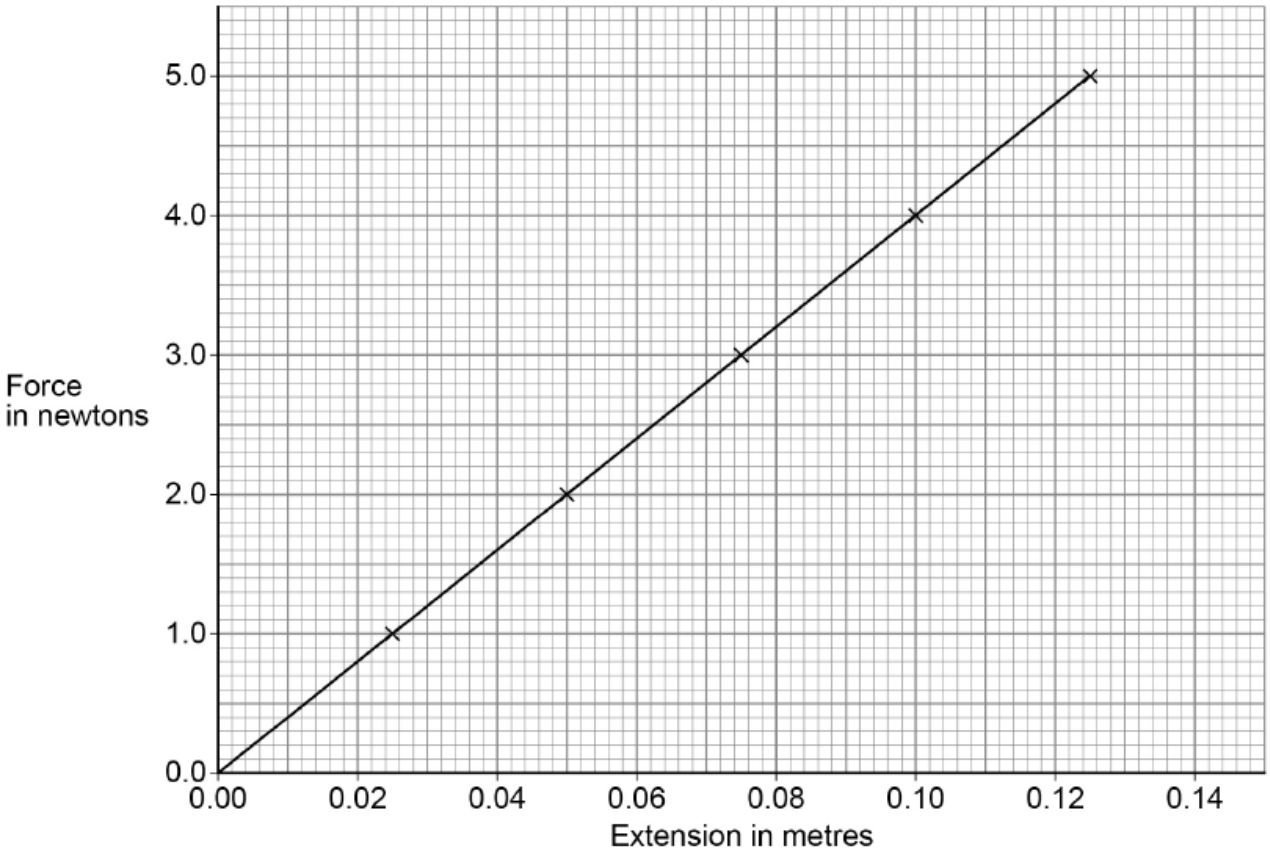
force = spring constant × extension ☐

force = $\frac{\text{extension}}{\text{spring constant}}$ ☐

force = $\frac{\text{spring constant}}{\text{extension}}$ ☐

Figure 4 is repeated below.

Figure 4



0 2 . 4 Determine the spring constant of the spring.

Use **Figure 4**.

[3 marks]

Spring constant = _____ N/m

0 2 . 5 The student concluded:

'The extension of the spring is directly proportional to the force applied to the spring.'

Describe how **Figure 4** supports the student's conclusion.

[2 marks]

0 2 . 6 The student repeated the investigation using a different spring with a spring constant of 13 N/m.

Calculate the elastic potential energy of the spring when the extension of the spring was 20 cm.

Use the Physics Equations Sheet.

[3 marks]

Elastic potential energy = _____ J