

Forces and Elasticity

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Forces and Elasticity
Difficulty Level	Bronze Level
Booklet	Question Paper

Time Allowed: 47 minutes

Score: /46

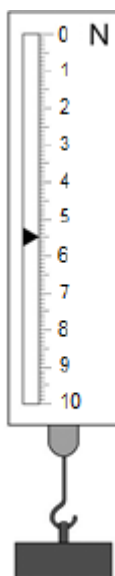
Percentage: /100

Grade Boundaries:

Q1. A newtonmeter measures the weight of objects.

Look at **Figure 1**.

Figure 1



(a) What is the weight of the object in **Figure 1**?

Weight = N

(1)

(b) The spring inside the newtonmeter behaves elastically.

What happens to the length of the spring when the object is removed from the newtonmeter?

Tick **one** box.

The spring gets longer

☐

The spring gets shorter

☐

The spring stays the same length

☐

(1)

- (c) A student carried out a practical to investigate the extension of a spring.

Write a method the student could have used.

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(4)

- (d) What could be done to improve the accuracy in this investigation?

Tick **two** boxes.

Use a pointer from the spring to measure the length.

☐

Use a stronger spring in the practical.

☐

Use a new spring between each reading.

☐

Make sure the spring is stationary before measuring length.

☐

Use a longer rule when measuring length.

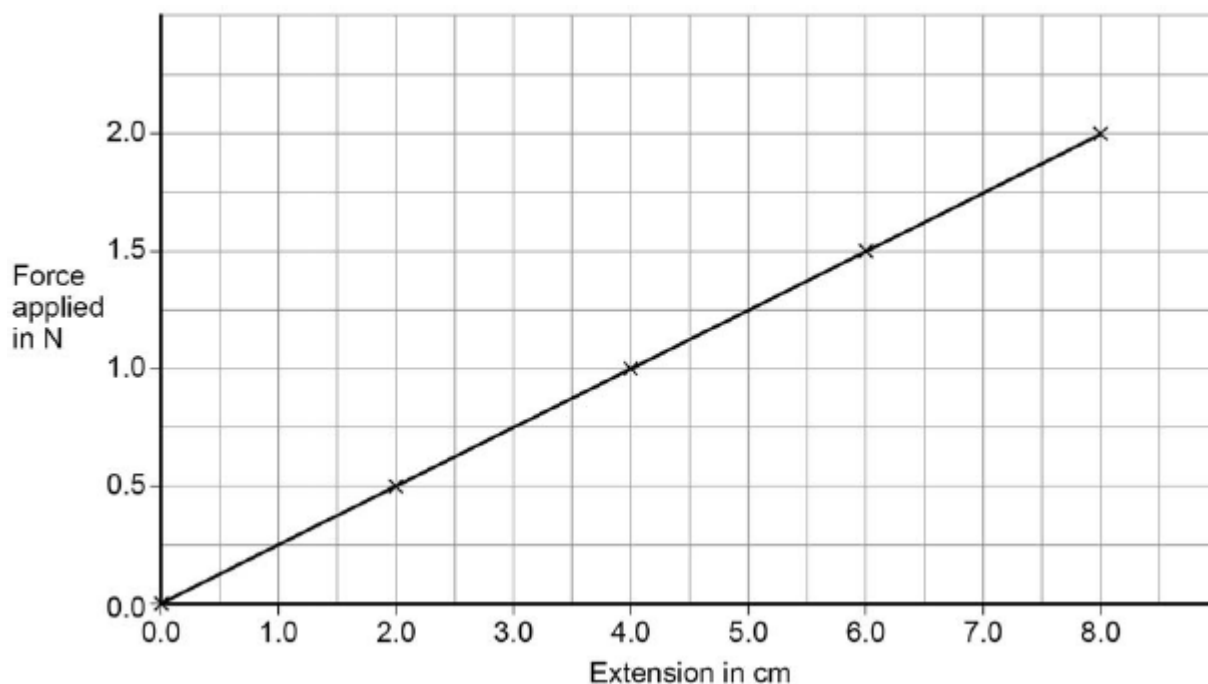
☐

(2)

- (e) The student added weights to a spring and measured the extension of the spring.

Figure 2 shows his results.

Figure 2



What is the relationship between force applied and extension?

Tick **one** box.

Extension is inversely proportional to force

☐

Extension increases by smaller values as force increases

☐

Extension is directly proportional to force

☐

(1)

- (f) Use **Figure 2** to determine the additional force needed to increase the extension in the spring from 5.0 cm to 7.0 cm.

Force needed = N

(1)

- (g) The table below shows some results with a different spring.

Force applied in N	Extension in m
0.0	0.000
0.5	0.025
1.0	0.050
1.5	0.075

What would the extension be with a force of 2.0 N?

Tick **one** box.

0.080 m

☐

0.080 m

☐

0.095 m

☐

0.100 m

☐

(1)

- (h) The spring constant for the spring in above **Table** is 20 N / m.

Calculate the work done in stretching the spring until the extension of the spring is 0.050m

Use the correct equation from the Physics Equation Sheet.

.....

.....

Work done = J

(2)

(Total 13 marks)

Q2. Forces can be classed as contact or non-contact forces.

- (a) Look at the table below.

Tick **one** box for each type of force to say whether it is a contact force or a non-contact force.

Type of force	Contact force	Non-contact force
Electrostatic		
Friction		
Gravity		

(3)

- (b) Force is a vector quantity.

What are two other vector quantities?

Tick **two** boxes.

Mass

☐

Time

☐

Velocity

☐

Speed

☐

Displacement

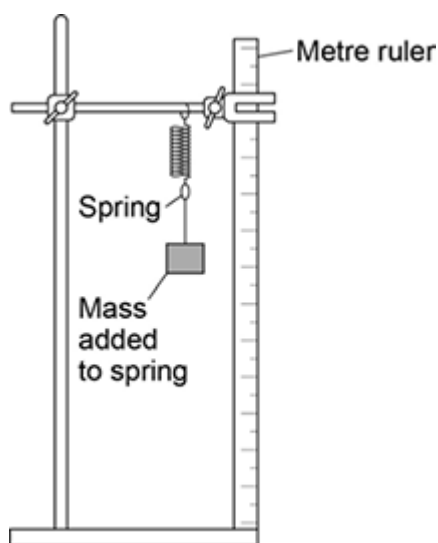
☐

(2)

- (c) A student does a practical to investigate the relationship between force and extension for a spring.

Figure 1 shows how he set up his experiment.

Figure 1



What could the student do to improve the accuracy of his investigation?

Tick **one** box.

Use a longer ruler to measure the length

☐

Use a pointer from the spring to measure the length

☐

Use a new spring between each reading

☐

Use a stronger spring in the investigation

☐

(1)

(d) The weight on the spring is the force applied to the spring.

The student puts a mass of 25 g on the spring.

Gravitational field strength = 9.8 N / kg

Calculate the weight on the spring.

Use the equation:

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

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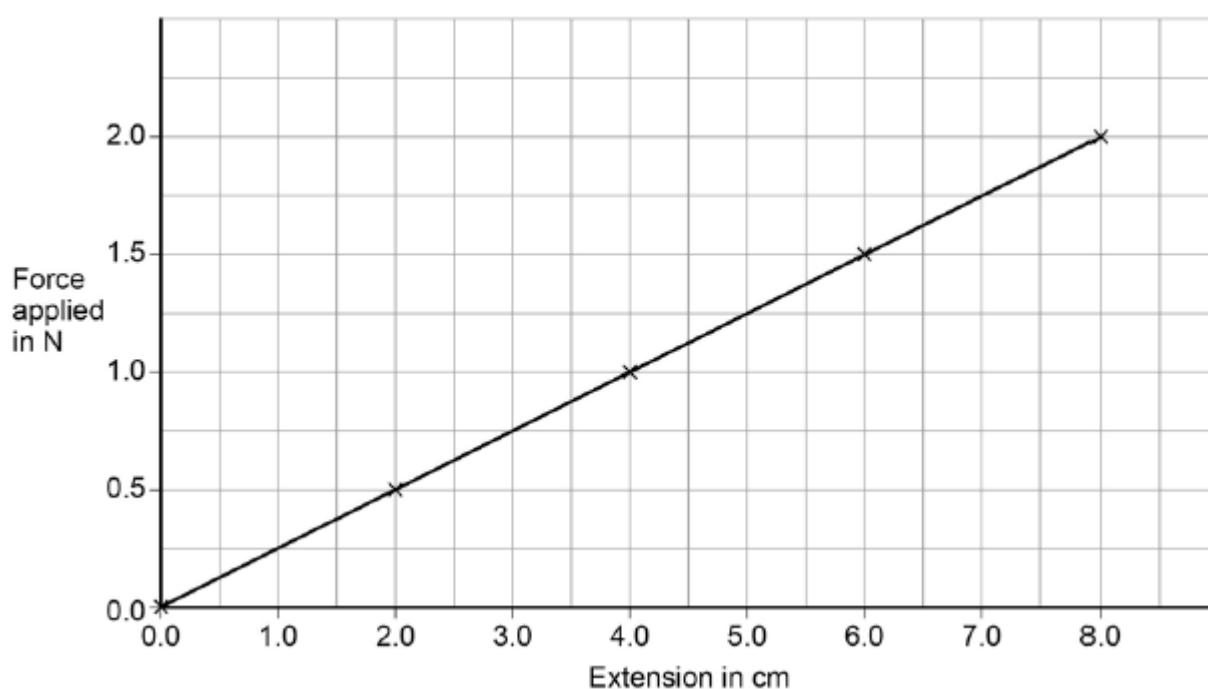
Weight on spring = N

(3)

- (e) The student plotted a graph of force applied and extension of the spring.

Figure 2 shows his graph.

Figure 2



What is the relationship between force applied and extension?

Tick **one** box.

Extension is directly proportional to force

☐

Extension increases by smaller values as force increases

☐

Extension is inversely proportional to force

☐

(1)

- (f) Use **Figure 2** to determine the force needed to give an extension of 4.5 cm.

Force needed = N

(1)

- (g) A different spring has a spring constant of 13.5 N / m.

Calculate the elastic potential energy stored in the spring when its extension is 12 cm.

Use the correct equation from the Physics equation sheet.

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Elastic potential energy = J

(2)

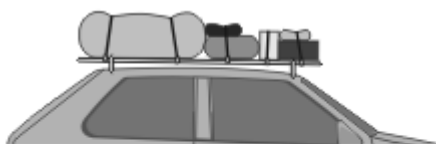
(Total 13 marks)

- Q3.** (a) The pictures show four objects. Each object has had its shape changed.



Bent metal ruler

A



Stretched bungee cords

B



Springs on a playground ride

C



Moulded plastic model car body

D

Which of the objects are storing elastic potential energy?

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Explain the reason for your choice or choices.

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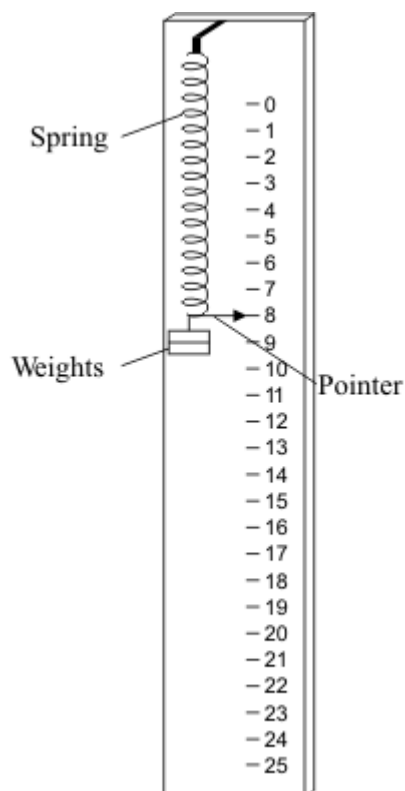
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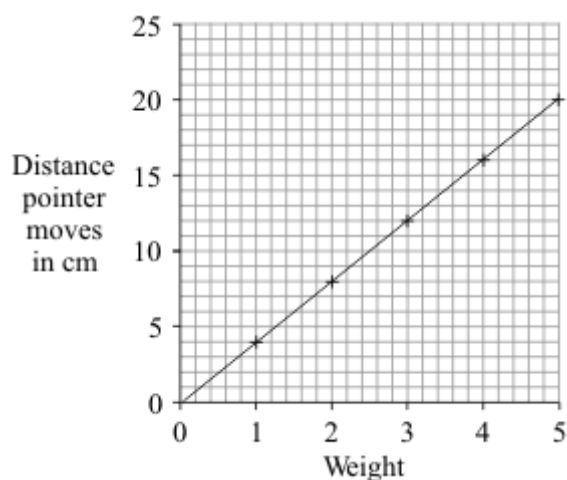
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(3)

- (b) A student makes a simple spring balance. To make a scale, the student uses a range of weights. Each weight is put onto the spring and the position of the pointer marked



The graph below shows how increasing the weight made the pointer move further.



- (i) Which **one** of the following is the unit of weight?.

Draw a ring around your answer.

joule

kilogram

newton

watt

(1)

- (ii) What range of weights did the student use?

.....

(1)

- (iii) How far does the pointer move when 4 units of weight are on the spring?

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(1)

- (iv) The student ties a stone to the spring. The spring stretches 10 cm.

What is the weight of the stone?

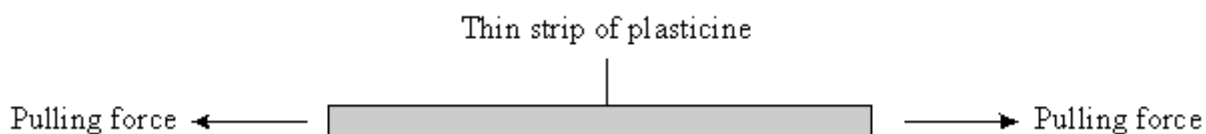
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(1)

(Total 7 marks)

- Q4.** (a) The diagrams below show pairs of forces acting on different objects. In each case describe what happens when the forces are increased. Then describe what happens when the forces are removed.

(i)



When the forces are increased

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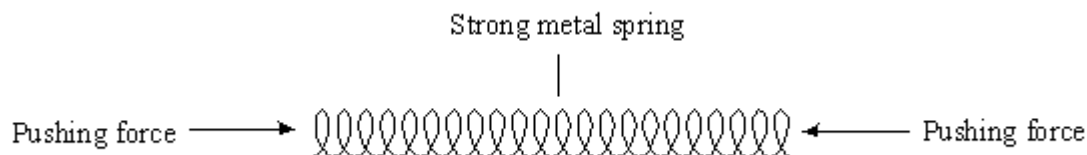
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When the forces are removed

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(ii)



When the forces are increased

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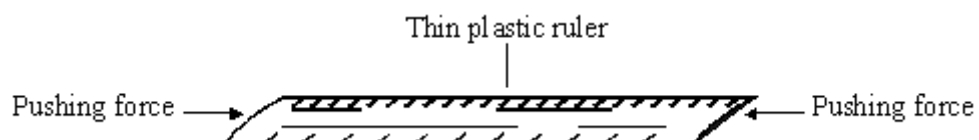
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When the forces are removed

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(iii)



When the forces are increased

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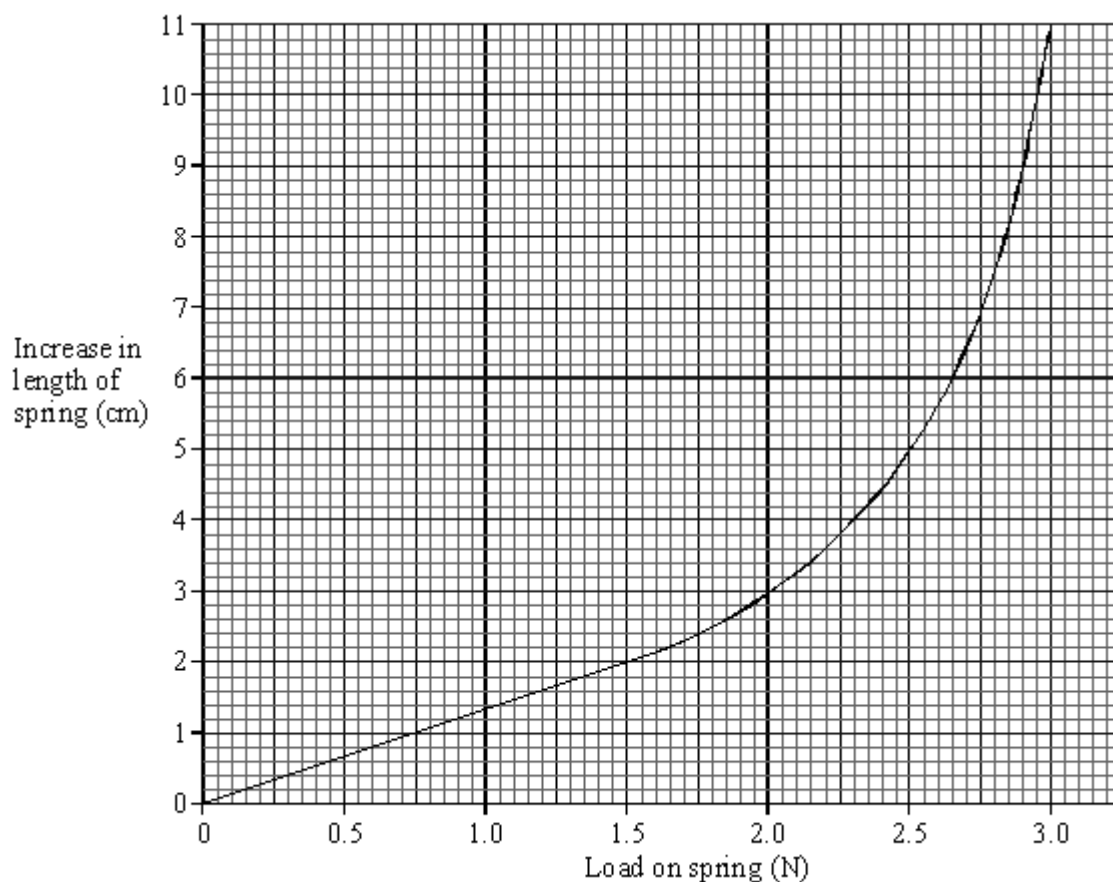
When the forces are removed

.....

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(6)

(b) The graph shows the increase in length of a spring against **load** (force).



The length of the spring with no load was 15 cm.

Use the graph to find:

- (i) The load needed to produce an increase in length of 2 cm.

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- (ii) The increase in length produced by a load of 2.3 N.

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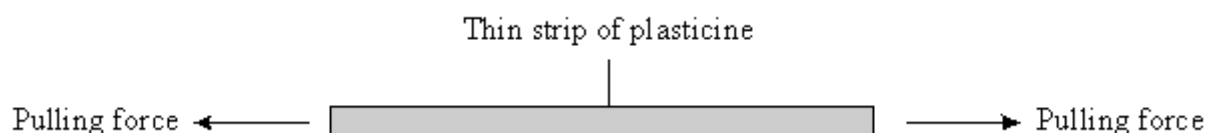
- (iii) The **length** of the spring when the load was 2.3 N.

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(3)
(Total 9 marks)

Q5. The diagrams show pairs of forces acting on different objects. In each case describe what happens when the forces are increased. Then describe what happens when the forces are removed.

(a)



When the forces are increased

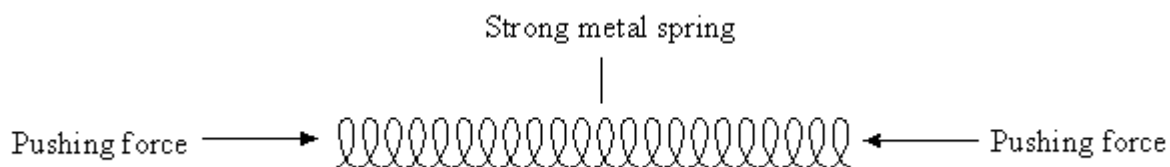
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When the forces are removed

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(2)

(b)



When the forces are increased

.....

When the forces are removed

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(2)

(Total 4 marks)