



## 7.3.7 Springs

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16 minutes

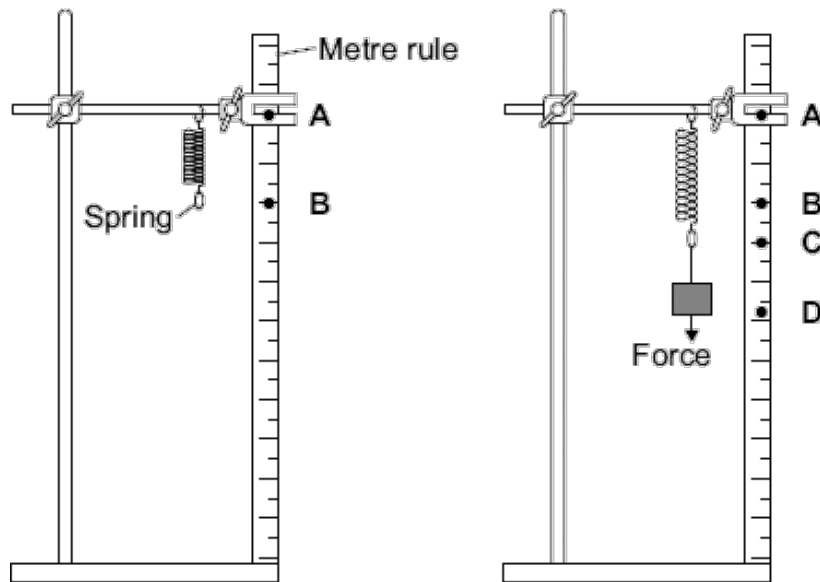


20 marks

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- Q1.** A student investigated how the extension of a spring depends on the force applied to the spring.

The diagram shows the spring before and after a force had been applied.



- (a) (i) Complete the following sentence using letters, **A**, **B**, **C** or **D**, from the diagram.

The extension of the spring is the distance between the positions labelled  
.....and ..... on the metre rule.

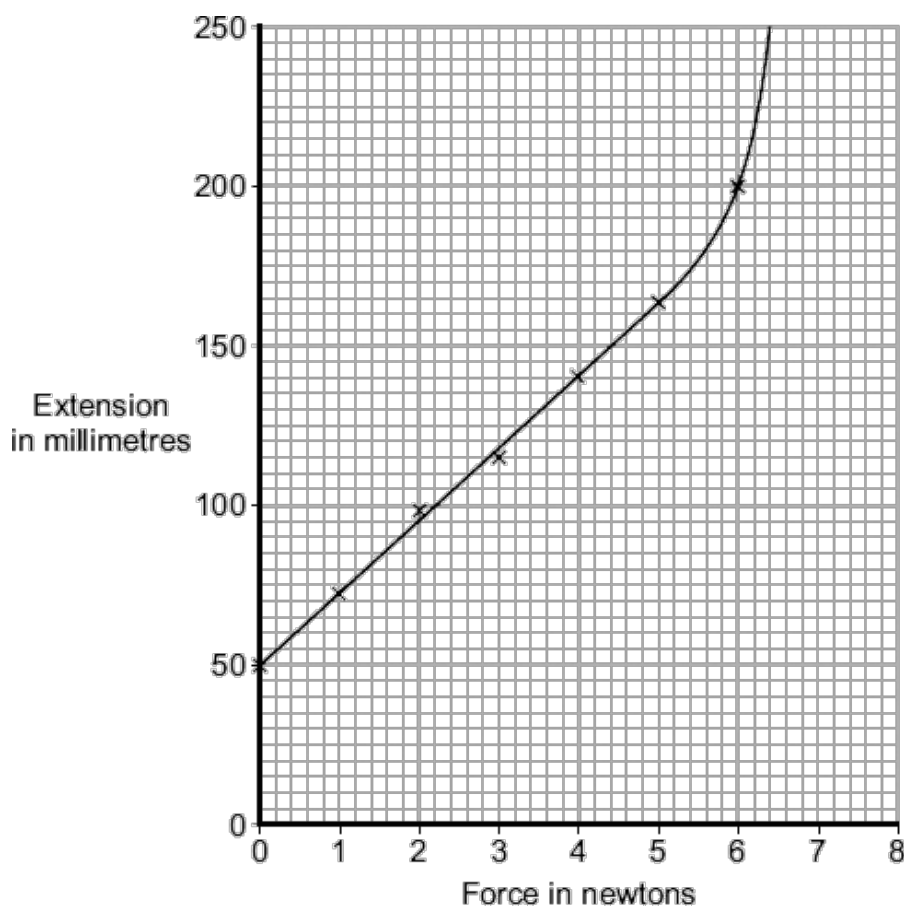
(1)

- (ii) What form of energy is stored in the stretched spring?

.....

(1)

- (b) The results from the investigation are plotted on the following graph.



- (i) The graph shows that the student has made an error throughout the investigation.

What error has the student made?

.....  
 .....

Give the reason for your answer.

.....  
 .....

(2)

- (ii) The student has loaded the spring beyond its *limit of proportionality*.

Mark on the graph line the *limit of proportionality* of the spring. Label the point **P**.

Give the reason for choosing your point **P**.

.....  
 .....

(2)

- (c) The student uses a different spring as a spring balance. When the student hangs a stone from this spring, its extension is 72 mm.

The spring does not go past the limit of proportionality.

Calculate the force exerted by the stone on the spring.

spring constant = 25 N/m
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Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

Force = ..... N

(2)  
(Total 8 marks)

- Q2.** Tom is doing a bungee jump from a bridge.



He is attached to one end of an elastic rope.  
The other end of the rope is attached to the bridge.  
Tom jumps from the bridge.

- (a) (i) What force makes Tom fall towards the ground?

.....

1 mark

- (ii) Tom does **not** hit the river below the bridge.  
What makes Tom stop falling before he hits the river?

.....

1 mark

- (b) The next person to do a bungee jump is Jill.

Jill weighs less than Tom.

Complete the sentence below using words from the box.

more than

less than

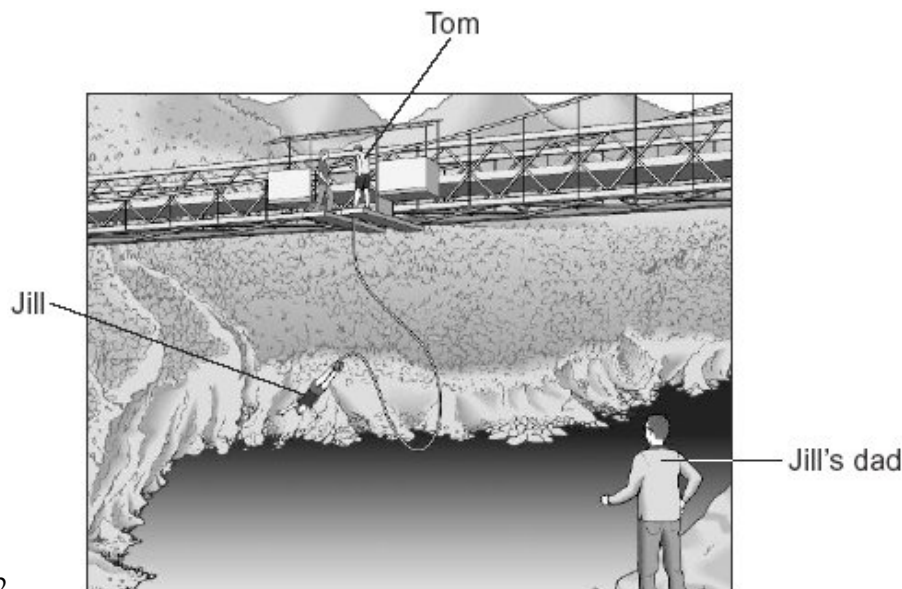
the same as

When Jill jumps, the rope will stretch .....

it did when Tom jumped.

1 mark

- (c) Jill's dad watches her doing the bungee jump.  
He is standing a long way from the bridge.  
Jill shouts 'bungee' at the same time as she jumps off the bridge.  
Jill's dad sees her jump before he hears her shout.



- (i) Why does Jill's dad **see** her jump before he **hears** her shout?

.....

.....

1 mark

- (ii) Tom is near Jill when she shouts. Her dad is far away.

Complete the sentence to describe how the shout will sound to Tom compared with Jill's dad. Use one word from the box.

<b>louder</b>	<b>higher</b>	<b>lower</b>	<b>quieter</b>
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The shout will sound ..... to Tom.

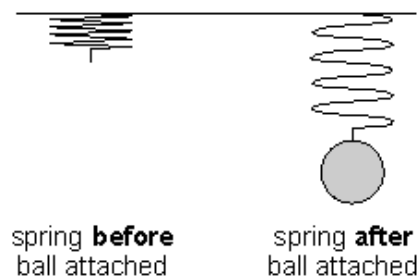
1 mark

- (iii) What part of Tom's ear vibrates when he hears Jill shout?

.....

1 mark  
maximum 6 marks

- Q3.** (a) John attaches a ball to a spring. The diagram below shows what happens.



- (i) Which arrow shows the direction of the **force of the ball on the spring**?  
Tick the correct box.



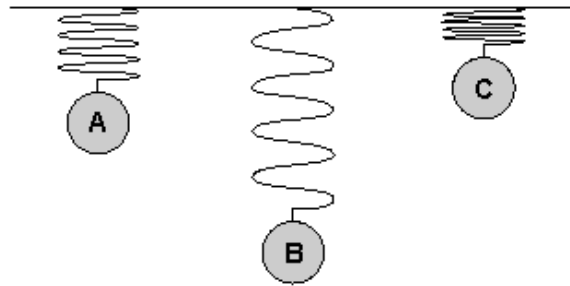
1 mark

- (ii) Which arrow shows the direction of the **force of the spring on the ball**?  
Tick the correct box.



1 mark

- (b) The diagram below shows three metal balls attached to **identical** springs.



Which ball is the heaviest?  
Write the letter.

.....

1 mark

Explain your answer.

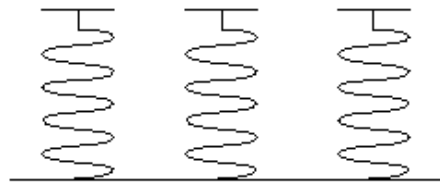
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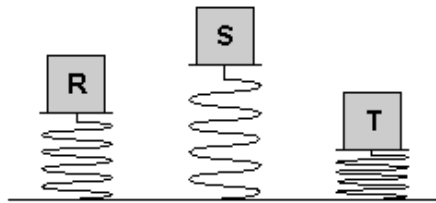
1 mark

- (c) John has another three **identical** springs.  
He puts a cube on each spring. Each cube has a different mass.

The diagrams below show the springs before and after John added the cubes.



springs **before** adding the cubes



springs **after** adding the cubes

Which cube is the heaviest?  
Write the letter.

.....

1 mark

Explain your answer.

.....

.....

1 mark  
maximum 6 marks

