

# OCR (A) Physics GCSE

## PAG 02 - Investigating the effect of forces on springs

### Flashcards

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What apparatus are required for this experiment?



What apparatus are required for this experiment?

- Clamp stand
- Weights (eg. 1N or 100g masses)
  - Ruler
  - Spring



What needs to be measured before the experiment is carried out?



What needs to be measured before the experiment is carried out?

The original length of the spring.



# What is the independent variable?



What is the independent variable?

The force (weight) added to the spring.



# What is the dependent variable?





What is the dependent variable?

The extension of the spring.



# How is extension calculated?



How is extension calculated?

Subtracting the original length of the spring from the new length.



# What should be recorded?



## What should be recorded?

- The force added, in N
- The extension of the wire for every interval of force



What condition must be met for the investigation to be valid?



What condition must be met for the investigation to be valid?

The spring should only deform elastically; before adding a new weight, all weights should be removed to ensure that the spring returns to its unstretched form.



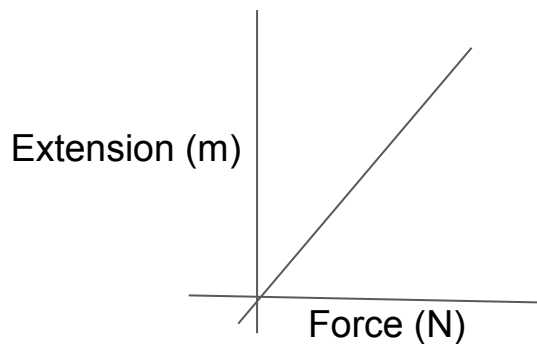
Describe a graph plotted from the results of this investigation.





Describe a graph plotted from the results of this investigation.

A force/extension graph should be plotted. It should show a directly proportional relationship.



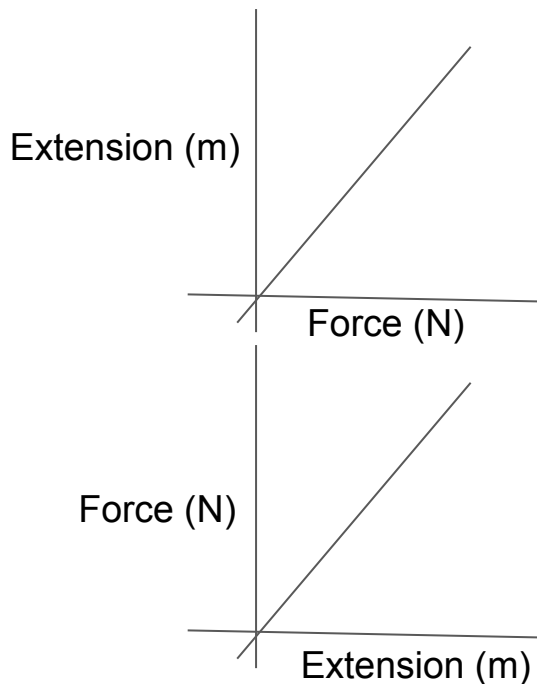
What does the gradient of the force-extension graph represent?



# What does the gradient of the force-extension graph represent?

It is the reciprocal of the spring constant,  $k$ .

If force is plotted on the y axis, the gradient is equal to the spring constant,  $k$ .



What law does this practical provide evidence for?



What law does this practical provide evidence for?

Hooke's law.



State the principle of Hooke's law.



State the principle of Hooke's law in words.

The extension of an elastic object (eg. a spring) is directly proportional to the force applied to it.



State the principle of Hooke's law in the form of an equation.





State the principle of Hooke's law in the form of an equation.

Force (N) = spring constant (N/m) x  
extension (m)

$$F = kx$$



What other investigation can this apparatus be applied to?



What other investigation can this apparatus be applied to?

Finding the mass of an object.



Give the equation used to calculate the mass of an object using measurements from this apparatus.



Give the equation used to calculate the mass of an object using measurements from this apparatus.

Mass = (spring constant x extension) /  
gravitational field strength

$$m = \frac{kx}{g}$$



Describe how this apparatus can be used to find the mass of an object.



Describe how this apparatus can be used to find the mass of an object.

- Attach the object to the spring and record the extension
- Apply the equation  $m = (kx)/g$  to calculate the mass



Explain where the equation  $m = (kx)/g$  is derived from.





Explain where the equation  $m = (kx)/g$  is derived from

$F = kx$  and  $W = mg$ . The force  $F$  is provided by the object's weight, so  $W = kx$  so  $mg = kx$ .

Then both sides are divided by  $g$  to give:

$$m = (kx)/g.$$



What safety precautions must be taken  
in this experiment?



What safety precautions must be taken in this experiment?

- Wear goggles in case of springs snapping
- Wear sensible and closed shoes as masses falling may cause injury

