

# OCR A Physics GCSE

## 2.3 - Forces in Action

### Flashcards

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Explain the relationship between the force applied and the extension of an elastic object.



Explain the relationship between the force applied and the extension of an elastic object.

The extension is directly proportional to the force applied, provided that the limit of proportionality is not exceeded.



What is meant by an inelastic (plastic) deformation?



## What is meant by an inelastic deformation?

- A deformation which results in the object being permanently stretched.
- The object doesn't return to its original shape when the force is removed.



State the equation relating force, spring constant and extension. Give appropriate units.



State the equation relating force, spring constant and extension. Give appropriate units.

Force = Spring Constant x Extension

$$F = kx$$

Force (N), Spring Constant (N/m)

Extension (m)



# What is Hooke's law?





# What is Hooke's law?

Hooke's law states that the force applied is directly proportional to the extension of an elastic object.



At what point does Hooke's law no longer apply?



At what point does Hooke's law no longer apply?

The **limit of proportionality**.

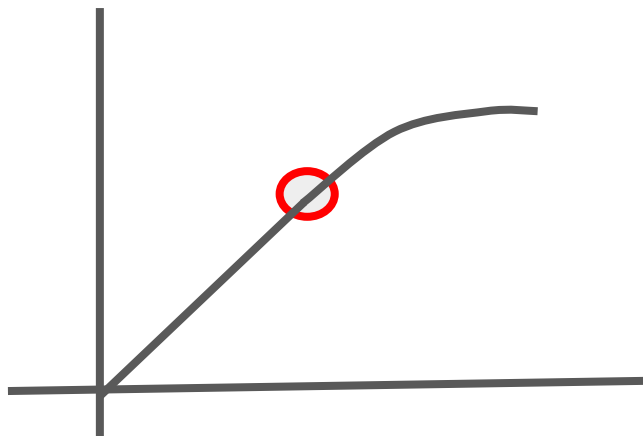


What does the limit of proportionality look like on an extension-load graph?



What does the limit of proportionality look like on an extension-load graph?

Where the graph stops being linear.



What type of energy is stored in a spring when it is stretched?



What type of energy is stored in a spring when it is stretched?

Elastic potential energy.



What can extension be replaced with in the equation for spring force?





What can extension be replaced with in the equation for spring force?

Compression.



What is the equation for elastic potential energy? Give SI units for all quantities involved.



What is the equation for elastic potential energy?  
Give SI units for all quantities involved.

$$E = \frac{1}{2} k x^2$$

Energy =  $\frac{1}{2}$  x Spring Constant x (Extension)<sup>2</sup>

Energy (J), Spring Constant (N/m), Extension(m)



# What is weight?



## What is weight?

The force that acts on an object due to gravity and the object's mass.



# What quantities does weight depend on?



# What quantities does weight depend on?

- The object's mass.
- The gravitational field strength at the given position in the field.



# What is the unit used for weight?





What is the unit used for weight?

The Newton (N).



What is the unit used for gravitational field strength?



What is the unit used for gravitational field strength?

N/kg



What is the equation used to calculate weight?



What is the equation used to calculate weight?

$$\text{Weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$



What is meant by an object's centre of mass?



What is meant by an object's centre of mass?

The single point through which an object's weight can be considered to act through.



What type of field does all matter have?





What type of field does all matter have?

A gravitational field.



How does the gravitational field of an object change as the object becomes more massive?



How does the gravitational field of an object change as the object becomes more massive?

The field strength increases.



What letter is used to represent gravitational field strength and what is its value at the surface of Earth?



What letter is used to represent gravitational field strength and what is its value at the surface of Earth?

$g$

The value of  $g$  on the surface of the Earth is approximately  $10 \text{ N/kg}$ .



What is the acceleration of an object falling in free fall with no resistive forces acting?



What is the acceleration of an object falling in free fall with no resistive forces acting?

10 m/s<sup>2</sup>



Why would your weight be different if you were on a different planet?





Why would your weight be different if you were on a different planet?

- The gravitational field strength varies for each planet.
- Weight is the product of mass and gravitational field strength.



What piece of equipment can be used to measure an object's weight?



What piece of equipment can be used to measure an object's weight?

A calibrated spring-balance or newton-meter.



What is an alternative name for the turning effect of a force?



What is an alternative name for the turning effect of a force?

A moment.



State the equation used to calculate the moment of a force. Give appropriate units.



State the equation used to calculate the moment of a force. Give appropriate units.

Moment of force = Force x Distance

Moment (Nm), Force (N), Distance (m)



What distance measurement is used when calculating a moment?





What distance measurement is used when calculating a moment?

The perpendicular distance from the pivot to the line of action of the force.



If an object is in equilibrium, what can be said about the moments acting on the object?



If an object is in equilibrium, what can be said about the moments acting on the object?

The clockwise moments are equal to the anticlockwise moments.



What does the direction of a resultant moment acting on an object tell you?



What does the direction of a resultant moment acting on an object tell you?

The direction that the object will rotate around the pivot point.



In any fluid, at what angle do the forces due to pressure act on a given surface?



In any fluid, at what angle do the forces due to pressure act on a given surface?

At right angles (normal to) the surface.



What can be said about the pressure in a simple hydraulic system?





What can be said about the pressure in a simple hydraulic system?

The pressure in the fluid is constant through the fluid (it cannot be compressed or expand).



Explain how a simple hydraulic lift works.



## Explain how a simple hydraulic lift works.

- The pressure is constant in the fluid.
- Force applied on each platform is equal to the product of pressure and area ( $F = pA$ ).
- One platform has a larger area than the other, meaning the force produced is greater than the force applied to the smaller platform.

