

Elastic limit
Maximum force applied to an object before it is permanently distorted

Limit of proportionality
The amount of force applied before an object no longer increases proportionally

Elastic distortion
Object returns to its original shape

Inelastic distortion
Object does not return to its original shape

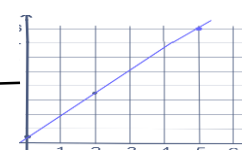
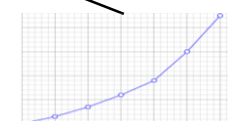
More than one force is needed to bend, stretch or compress an object.

Forces are needed to change the shape of an object.

Forces and elasticity

Non-linear relationship
Extension does not increase at the same rate as force increases

Linear relationship
Extension increases at the same rate as force increases



Diagonal line through 0,0 = directly proportional.

Diagonal line = proportional.

Extension and energy transfers

Core Practical
Investigate the extension and work done when applying force to a spring

Measure initial length of spring, Add masses to spring. Re-measure the spring length. Work out the extension.

Force exerted on a spring = spring constant X extension.

$$F = k \times x$$

Work done on a spring = $\frac{1}{2} \times$ spring constant X extension².

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

Work done can also be calculated by working out the area under a force-extension graph.

EDEXCEL Topic 15 FORCE AND MATTER

PHYSICS ONLY

Pressure

PHYSICS HIGHER ONLY

Depth and pressure
The deeper you go, the greater the pressure
The further down you go, the more water is above you, so the more weight there is.

Density and pressure
Fluid with greater densities have greater pressure
The greater the density, the more particles there are, so the more weight there is.

Pressure due to a column of liquid = height of the column X density of liquid X gravitational field strength.

$$P = h \times \rho \times g$$

Force	Newton (N)
Spring constant	Newton per meter (N/m)
Extension	Metres (m)
Energy transferred	Joules (J)
Area	Metres squared (m²)
Pressure	Pascals (Pa)
Height	Metres (m)
Density (liquid)	Kilogram per cubic metre (Kg/m³)
Gravitational field strength	Newton per kilogram (N/Kg)

Atmospheric pressure
Pressure caused by particles of air
Less particles of air the higher up you go, so less atmospheric pressure
More particles of air nearer you are to sea level. Atmospheric pressure is 100,000Pa.

Pressure in fluids
Depends on depth and density
The deeper you go, the more weight of fluid is above you to exert pressure.

Pressure in fluids causes a force normal to a surface.

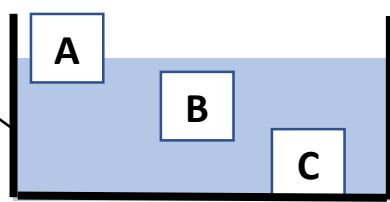
$P = F \div A$
Pressure = force normal to surface \div area of surface

Snow shoes
Area large, so force is spread out, pressure reduced

Stiletto shoes
Area small so force is concentrated, pressure increased

Up thrust
Force acting upon objects in a fluid
Force occurs due to the difference in pressure above and below object.

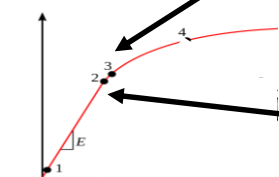
Floating
The up thrust on the object is equal to the weight of the object.
The up thrust is equal to the water displaced by their density.



A
Floating near the top of the water
Less pressure is needed beneath the block to balance it's weight

B
Floating deeper in the water
More pressure is needed beneath the block to balance it's weight

C
Sunk to the bottom
Weight of block greater than the pressure beneath it.



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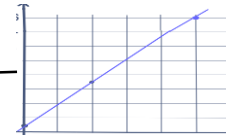
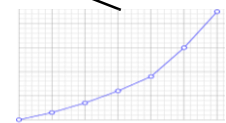
Extension increases at the same rate as force increases

Plotted graph would not be a diagonal straight line

Plotted graph would be a diagonal straight line

Diagonal line through 0,0 = directly proportional.

Diagonal line = proportional.



Forces and elasticity

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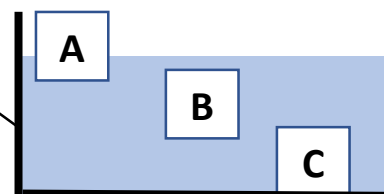
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Force acting upon objects in a fluid

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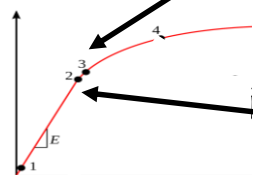
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Elastic limit

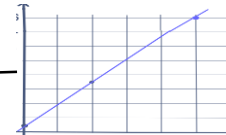
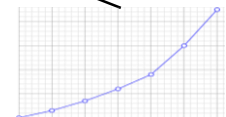
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Inelastic distortion

Non-linear relationship

Linear relationship



Forces and elasticity

Extension and energy transfers

Core Practical

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PHYSICS ONLY

Pressure

PHYSICS HIGHER ONLY

Depth and pressure

Density and pressure

$P =$

Work done can also be calculated

Force

Spring constant

Extension

Energy transferred

Area

Pressure

Height

Density (liquid)

Gravitational field strength

Snow shoes

Stiletto shoes



Up thrust

Floating

A

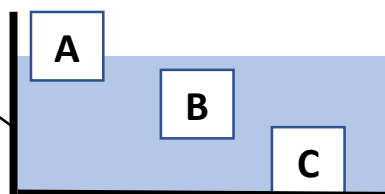
B

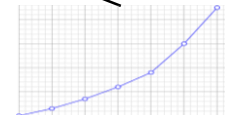
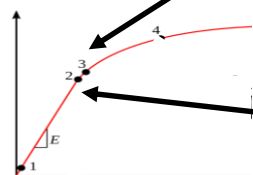
C

A

B

C





Forces and elasticity

Extension and energy transfers

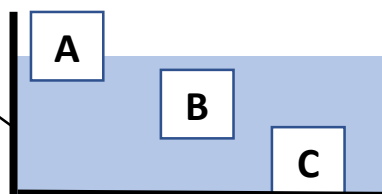
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