

Definitions and Concepts for AQA Physics A Level

Topic 4: Mechanics and Materials

Breaking Stress: The maximum stress that an object can withstand before failure occurs.

Brittle: A brittle object will show very little strain before reaching its breaking stress.

Centre of Mass: The single point through which all the mass of an object can be said to act.

Conservation of Energy: Energy cannot be created or destroyed - it can only be transferred into different forms.

Conservation of Momentum: The total momentum of a system before an event, must be equal to the total momentum of the system after the event, assuming no external forces act.

Couple: Two equal and opposite parallel forces that act on an object through different lines of action. It has the effect of causing a rotation without translation.

Density: The mass per unit volume of a material.

Efficiency: The ratio of useful output to total input for a given system.

Elastic Behaviour: If a material deforms with elastic behaviour, it will return to its original shape when the deforming forces are removed. The object will not be permanently deformed.

Elastic Collision: A collision in which the total kinetic energy of the system before the collision is equal to the total kinetic energy of the system after the collision.

Elastic Limit: The force beyond which an object will no longer deform elastically, and instead deform plastically. Beyond the elastic limit, when the deforming forces are removed, the object will not return to its original shape.

Elastic Strain Energy: The energy stored in an object when it is stretched. It is equal to the work done to stretch the object and can be determined from the area under a force-extension graph.

Equilibrium: For an object to be equilibrium, both the resultant force and resultant moment acting on the object must be equal to zero.



Hooke's Law: The extension of an elastic object will be directly proportional to the force applied to it up to the object's limit of proportionality.

Impulse: The change of momentum of an object when a force acts on it. It is equal to the product of the force acting on the object and the length of time over which it acts.

Inelastic Collision: A collision in which the total kinetic energy of the system before the collision is not equal to the kinetic energy of the system after the collision.

Moment: The product of a force and the perpendicular distance from the line of action of the force to the pivot.

Momentum: The product of an object's mass and velocity.

Newton's First Law: An object will remain in its current state of motion, unless acted on by a resultant force. An object requires a resultant force to be able to accelerate.

Newton's Second Law: The sum of the forces acting on an object is equal to the rate of change of momentum of the object.

Newton's Third Law: Every action has an equal and opposite reaction. If an object exerts a force on another object, then the other object must exert a force back, that is opposite in direction and equal in magnitude.

Plastic Behaviour: If a material deforms with plastic behaviour, it will not return to its original shape when the deforming forces are removed. The object will be permanently deformed.

Principle of Moments: For an object to be in equilibrium, the sum of the clockwise moments acting about a point must be equal to the sum of the anticlockwise moments acting about the point.

Scalar: A scalar quantity is one that only has a magnitude. Examples include length, mass and temperature.

Spring Constant: The constant of proportionality for the extension of a spring under a force. The higher the spring constant, the greater the force needed to achieve a given extension.

Stiffness: A measure of how difficult it is to stretch a given object.

Tensile Strain: The ratio of an object's extension to its original length. It is a ratio of two lengths and so has no unit.



Tensile Stress: The amount of force acting per unit area. Its unit is the Pascal (Pa).

Terminal Speed: The maximum speed of an object that occurs when the resistive and driving forces acting on the object are equal to each other.

Vector: A vector quantity is one that has both a magnitude and a direction. Examples include velocity, displacement and acceleration.

Young Modulus: The ratio of stress to strain for a given material. Its unit is the Pascal (Pa).

