

Definitions and Concepts for Edexcel (IAL) Physics A-level

Unit 1: Mechanics and Materials

1.1 Mechanics

Acceleration: The rate of change of velocity.

Acceleration-Time Graph: Plot showing how acceleration changes over a period of time. The area underneath the graph represents change in velocity. The gradient represents the rate of change of acceleration, called 'jerk'.

Centre of Gravity: The single point through which the object's weight can be said to act.

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

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

Coplanar Vectors: Vectors which lie on the same plane.

Displacement-Time Graph: Plots showing how displacement changes over a period of time. The gradient gives the velocity. Curved lines represent an acceleration.

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

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

Free-Body Force Diagram: A diagram showing all the forces acting on an object. It is a good starting point to any mechanics problem.

Free-Fall: An object is said to be in free fall when the only force acting on it is the force of gravity.

Gravitational Field Strength: The force per unit mass exerted on a small test mass placed within the field.

Gravitational Potential Energy: The component of an object's energy due to its position in a gravitational field.

Kinetic Energy: A form of energy that all moving objects possess. It is directly proportional

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



to the mass of the object, and to the square of its velocity.

Moment of a Force: 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 linear velocity.

Newton's First Law of Motion: 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 of Motion: 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 of Motion: 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.

Power: The rate of transfer of energy.

Projectile Motion: The motion of an object that is fired from a point and then upon which only gravity acts. When solving projectile motion problems, it is useful to split the motion into horizontal and vertical components.

Scalar Quantity: A quantity that only has a magnitude, without an associated direction. Examples include speed, distance and temperature.

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

Uniformly Accelerated Motion: Motion where the acceleration is constant. This allows the use of the SUVAT equations.

Vector Quantity: A quantity that has both a magnitude and an associated direction. Examples include velocity, displacement and acceleration.

Velocity-Time Graph: Plots showing how velocity changes over a period of time. The gradient gives acceleration. The area beneath the graph gives change in displacement. Curved lines represent changing acceleration.

Weight: The force of gravity on an object, the product of the object's mass and the acceleration due to gravity.

Work Done: The energy transferred by a force moving over a distance. It is equal to the product of the magnitudes of the force and distance.



1.2 Materials

Breaking Stress: The maximum stress a material can withstand without fracturing.

Compression: The result of two coplanar forces acting into an object. Compression usually results in a reduction in the length of the object.

Density: The mass per unit volume of a material.

Elastic Deformation: 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 Limit: The maximum stress that can be applied to an object without plastic deformation.

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.

Force-Compression Graph: The gradient of a force-compression graph for a spring obeying Hooke's law is equal to the spring constant. The area under the graph is the work done in stretching the spring.

Force-Extension Graph: The gradient of a force-extension graph for a spring obeying Hooke's law is equal to the spring constant. The area under the graph is the work done in stretching the spring.

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.

Laminar Flow: A state of flow where layers of fluid move together in parallel with little or no mixing between layers.

Limit of Proportionality: The point at which the stress on an object is so great that Hooke's law no longer applies to an object.

Plastic Deformation: 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.

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

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

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



Stress-Strain Graph: A plot with stress on the y-axis and strain on the x-axis. The gradient gives the Young Modulus of the material.

Tensile Forces: Forces which stretch a material, increasing the strain.

Turbulent Flow: A state of flow where layers of fluid mix together unpredictably causing a chaotic state.

Upthrust: The upwards force that a fluid applies on an object. According to Archimedes' Principle, it is equal to the weight of the fluid displaced by that object.

Viscosity: A quantity measuring the internal friction of a fluid, it acts to reduce the flow of a fluid. It is temperature dependent.

Viscous Drag: The magnitude of the force of viscosity acting on a spherical body as it moves through a fluid is proportional to its radius, its velocity and the fluid's viscosity. This only applies to spherical bodies travelling in laminar, non-turbulent, flow.

Yield Point: The point on a force-extension graph at which a material begins to rapidly extend without any additional stress.

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

