

# Definitions and Concepts for OCR (A) Physics GCSE

## Topic 2: Forces

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*Definitions in **bold** are for higher tier only*

*Definitions marked by '\*' are for separate sciences only*

**Acceleration due to Gravity:** The acceleration,  $g$ , experienced by an object travelling in free-fall. Its value at the surface of Earth is  $10 \text{ m/s}^2$ .

**Acceleration:** The rate of change of velocity. It can be calculated from the gradient of a velocity-time graph.

**Balanced Forces:** A resultant force of zero.

**Centripetal Force:** The resultant force that acts towards the centre of the circular path of an object travelling with circular motion.

**Circular Motion:** The motion of an object travelling in a circle. An object travelling in circular motion is always accelerating due its continual direction change. This means that a centripetal force is always required.

**Contact Force:** A force that acts on an object through physical contact.

**Displacement:** A measure of how far an object moves in a given direction. It is the straight line between the starting and finishing points and is a vector quantity.

**Distance-Time Graph:** A plot of how an object's distance changes over time. The gradient of the graph at any point, equals the object's speed at that point.

**Distance:** A measure of how far an object moves. It doesn't depend on direction and is therefore a scalar quantity.

**Distortion:** The changing of an object's size or shape as a result of a deforming force.

**Elastic Deformation:** A non-permanent deformation for which the object will return to its original shape when the deforming forces are removed.

**Elastic Limit:** The force beyond which an object will no longer deform elastically, and will instead deform plastically.

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**Electric Field:** A region where a charge will experience a non-contact electrostatic force.

**Force Field:** A region where an object will experience a non-contact force.

**Force Vectors:** An arrow that represents a force. The length represents the force's magnitude and the arrowhead shows the direction in which it acts.

**Free Body Diagram:** A visual representation of the forces that act on an object.

**Free-Fall:** Motion under the force of gravity alone.

**Friction:** A resistive contact force that acts to oppose the relative motion between two surfaces.

**\*Gears:** A simple mechanism that can transmit the rotational effect of a force. They can act as force multipliers.

**Gravitational Field:** A region where a mass will experience a non-contact gravitational force. All matter produces a gravitational field around it, and the greater its mass, the stronger the field.

**Gravitational Force:** A force that all matter experiences when placed in a gravitational field. This force is always attractive.

**Hooke's Law:** The extension of a spring is directly proportional to the force applied to it, up to the limit of proportionality. The constant in this relationship is known as the spring constant.

**\*Hydraulic Lift:** A system that can act as a force multiplier by connecting two platforms with different areas by a fluid. The pressure in the fluid is the same throughout and so the platform with the smaller area experiences a greater force.

**Inertial Mass:** A measure of how hard it is to change an object's velocity. It equals the ratio of force over acceleration.

**\*Lever:** A simple mechanism that can transmit the rotational effect of a force. It can act as a force multiplier.

**Limit of Proportionality:** The point beyond which the extension of an elastic object is no longer directly proportional to the force applied to it.

**Linear Relationship:** A relationship between two variables where if one variable increases, so does the other by the same factor. They produce straight lines when plotted.



**Magnetic Field:** A region where a magnetic material will experience a non-contact magnetic force.

**\*Moment:** The turning effect of a force, equal to the product of the magnitude of the force and the perpendicular distance from the pivot to the line of action of the force.

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

**Newton's First Law:** If a stationary object's resultant force is zero, the object will remain stationary. If a moving object's resultant force is zero, the object will continue to move at a constant velocity (same speed and direction).

**Newton's Second Law:** An object's acceleration is directly proportional to the resultant force acting on it, and inversely proportional to the object's mass.

**Newton's Third Law:** The forces that two objects exert on each other when they interact are equal and opposite.

**Non-Contact Force:** A force that acts on an object at a distance. There is no physical contact, and instead the force acts through a field.

**\*Pivot:** The point around which something rotates.

**Plastic Deformation:** A permanent deformation for which the object will no longer return to its original shape when the deforming forces are removed.

**Power:** The rate at which energy is transferred, or the rate at which work is done. It is calculated by dividing the work done by the time taken.

**\*Principle of Moments:** For an object in equilibrium, the sum of the clockwise moments about any point on the object must equal the anticlockwise moments about that same point.

**Resultant Force:** The single force that can replace all the individual forces acting on an object, and have the same effect.

**\*Resultant Moment:** The single moment that has the same effect as the sum of all the other clockwise and anticlockwise moments acting on an object.

**Scalar Quantities:** Quantities that only have a magnitude, not a direction.

**Speed:** A scalar quantity that is a measure of the rate of change of distance. The average speed is calculated by dividing the distance travelled by the speed taken.

**Spring Constant:** A measure of a spring's stiffness. The higher the spring constant, the smaller the extension is for a given force.

**Vector Quantities:** Quantities that have both a magnitude and direction. They are



represented by an arrow, with the length representing the magnitude and the arrowhead representing the direction.

**Velocity-Time Graph:** A plot of how an object's velocity changes over time. The gradient of the graph at any point, equals the object's acceleration at that point. **The area under the graph equals the object's displacement.**

**Velocity:** A vector quantity that is a measure of the rate of change of displacement. It is the speed in a given direction.

**Weight:** The force acting on an object due to gravity. It is equal to the product of the object's mass and the gravitational field strength at its location.

