

Forces and Their Effects

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

Definitions marked by “” are for separate sciences only*

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

***Atmosphere:** The thin layer of air surrounding the Earth, which gets less dense with increasing altitude.

Braking Distance: The distance a vehicle travels under the braking force. This can be affected by adverse road and weather conditions as well as the condition of the vehicle.

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

Changes of Momentum: When a force acts on a moving object, or one an object that has the ability to move, a change of momentum will occur. The force is equal to the rate of change of momentum.

Conservation of Momentum: The total momentum of a system before an event is always equal to the total momentum of the system after the event.

Contact Forces: A force that occurs when objects are physically touching.

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: A measure of how far an object moves, that does not depend on direction and is therefore a scalar quantity.

Elastic Deformation: Non-permanent deformation which allows the object to 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.

Elastic Potential Energy: The energy stored in a spring when it is stretched or compressed, due to the work done on the spring by the deforming force. It is equal to the work done as long as the object does not plastically deform.

Equilibrium: An object is in equilibrium if the resultant force and resultant moment are both equal to zero.

***Floating:** An object will float if the volume of liquid it displaces has a greater weight than that of the object itself. The upthrust acting on the object is greater than its weight.

***Fluid:** A liquid or gas.

Forces: A push or pull that an object experiences due to the interaction with another object. Force is a vector quantity.

Inertia: The tendency of an object to remain in its same state of uniform motion or rest.

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

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

***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.

Newtonmeter: A calibrated spring-balance used to measure weight.

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 the same speed, and in the same direction.

Newton's Second Law: An object's acceleration is directly proportional to the force applied to it, and inversely proportional to its mass.

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

Non-Contact Forces: A force that occurs when objects are physically separated.

Plastic Deformation: Permanent deformation which means the object will no longer return to its original shape when the deforming forces are removed.

***Pressure in a Column:** The pressure in a column of liquid is equal to the product of the liquid's density, the height of the column and the gravitational field strength.

Resolution of Forces: All forces can be resolved into two perpendicular components that have the same effect as the single force.

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.

***Sinking:** An object will sink if the volume of liquid it displaces has a lower weight than that of the object itself. The upthrust acting on the object is lower than its weight and so there is a resultant downwards force.

Speed: A scalar quantity that is a measure of the rate of increase of distance.

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

Stopping Distance: The sum of the thinking and braking distances.

Thinking Distance: The distance a vehicle travels during the driver's reaction time. Typical human reaction times are in the range of 0.2-0.9 seconds. This reaction time may be affected by tiredness, drugs or alcohol.

Upthrust: The upward force acting on an object in a fluid, due to it experiencing a greater pressure below it than above it.

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: 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.

Work Done: Work is done on an object when a force causes it to move through a distance. It is directly proportional to the distance travelled and the magnitude of the force in the direction of motion.