3.1: Motion

Acceleration: The rate of change of velocity.

Average Speed: Distance over time for the entire region of interest.

Braking Distance: The distance travelled between the brakes being applied and the vehicle coming to a stop. It is affected by the vehicle and road conditions.

Displacement: The direct distance between an object's starting and ending positions. It is a vector quantity and so has both a direction and a magnitude.

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

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

Instantaneous Speed: The exact speed of an object at a specific given point

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.

Reaction Time: The time taken to process a stimulus and trigger a response to it. It is affected by alcohol, drugs and tiredness.

Stopping Distance: The sum of thinking distance and braking distance for a driven vehicle.

Thinking Distance: The distance travelled in the time it takes for the driver to react. It is affected by alcohol, drugs and tiredness

Velocity-Time Graphs: Plots showing how velocity changes over a period of time. The gradient gives acceleration. Curved lines represent changing acceleration.

Velocity: The rate of change of displacement. It is a vector quantity and so has both a direction and a magnitude.

3.3: Work, Energy and Power

Conservation of Energy: In a closed system with no external forces the total energy of the system before an event is equal to the total energy of the system after the event. The energy does not need to be in the same form after the event as it was before the event.

Efficiency: The useful output (e.g. power, energy) of a system divided by the total output.

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3.3: Work, Energy and Power (cont)

Kinetic Energy: The energy an object has due to its motion. It is the amount of energy that would be transferred from the object when it decelerates to rest.

Power: The work done or energy transferred by a system divided by the time taken for that to be done.

Work Done: The energy transferred when a force moves an object over a distance.

3.5: Momentum

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.

Elastic Collisions: 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.

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 Collisions: 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.

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

3.2: Forces in Action

Archimedes' Principle: The upwards force acting on an object submerged in a fluid, is equal to the weight of the fluid it displaces.

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

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

3.2: Forces in Action (cont)

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.

Drag: The frictional force that an object experiences when moving through a fluid.

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

Friction: The resistive force produced when there is relative movement between two surfaces

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

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. It is also expressed as the net force acting an object equaling the product of the object's mass and acceleration

Normal Contact Force: The reaction force between an object and surface.

Pressure: The force that a surface experiences per unit area. It is measured in Pascals (Pa)

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.

Tension: The result of two forces acting on an object in opposite, outwards directions.

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.

Triangle of Forces: A method of determining the resultant force of two forces. The two forces are joined tip to tail and the resultant force is given by the force that would complete the triangle

Upthrust: The upwards force that a fluid applies on an object

Weight: The product of an object's mass and the gravitational field strength at its location

3.4: Materials

Brittle: A brittle object is one that shows very little strain before reaching its breaking stress.

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

Compressive Deformation: The changing of an object's shape due to compressive forces.

Ductile: A material is ductile if it can undergo very large extensions without failure. Ductile materials can be stretched into wires.

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 Potential 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

Extension: The increase of an object's length

Force-Extension Graph: A plot showing how an object extends as the force applied increases. For an elastic object, the gradient should be linear up to the limit of proportionality. The gradient gives the spring constant.

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 proportionalitHooke'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

5.2: Circular Motion

Angular Velocity: An object's rate of change of angular position.

Centripetal Acceleration: The acceleration of an object moving in circular motion. Any object in circular motion must have an acceleration since the direction of the object, and therefore the velocity of the object, is constantly changing.

Centripetal Force: The resultant force responsible for an object moving in circular motion. Centripetal forces always act towards the centre of the object's rotation.