

Year 1 Knowledge Organiser Mechanics

1. Modelling in Mechanics

Particle	<p>Dimensions of the object are negligible</p> <ul style="list-style-type: none"> • Mass of the object is concentrated at a single point • Rotational forces and air resistance can be ignored
Rod	<p>All dimensions but one are negligible, like a pole or a beam</p> <ul style="list-style-type: none"> • No thickness • Ridged (does not bend or buckle)
Lamina	<p>Object with area but negligible thickness, like a sheet of paper</p> <ul style="list-style-type: none"> • Mass is distributed across a flat surface
Centre of Mass	<p>The geometrical centre of an object</p>
Uniform body	<p>Mass is distributed evenly</p> <ul style="list-style-type: none"> • Mass of the object is concentrated at a single point at the centre of mass
Light object	<p>Mass is small compared to other masses, like string or a pulley</p> <ul style="list-style-type: none"> • Treat object as having zero mass • Tension the same at both ends of a light string
Inextensible string/rod	<p>A string/rod that does not stretch under load</p> <ul style="list-style-type: none"> • Acceleration is the same in objects connected by a taut inextensible string/rod
Smooth surface	<ul style="list-style-type: none"> • Assume that there is no friction between the surface and any object on it
Rough surface	<ul style="list-style-type: none"> • Objects in contact with the surface experience a frictional force if they are moving or acted on by a force
Wire	<p>Rigid thin length of material</p> <ul style="list-style-type: none"> • Treated as one dimensional
Bead	<p>Particle with a hole in it for threading on a wire or string</p> <ul style="list-style-type: none"> • Moves freely along a wire or string • Tension is the same on either side of the bead
Peg	<p>A support from which a body can be suspended or rested</p> <ul style="list-style-type: none"> • Dimensionless and fixed • Can be rough or smooth as specified in question
Air resistance	<p>Resistance experienced as an object moves through the air</p> <ul style="list-style-type: none"> • Usually modelled as being negligible
Gravity	<p>Force of attraction between all objects, acceleration due to gravity is denoted by g</p> <ul style="list-style-type: none"> • All objects with mass are attracted towards the Earth • Earth's gravity is uniform and acts vertically downwards • g is constant and is taken as 9.8ms^{-2}, unless otherwise stated in the question
Weight	<p>Gravitational force of an object which acts vertically downwards</p>

Normal reaction	The force which acts perpendicular to a surface when an object is in contact with the surface
Friction	A force which opposes the motion between two rough surfaces
Tension	The force acting on an object if it is being pulled by string/rod
Thrust/compression	The force acting on an object if it is being pushed by a rod
Buoyancy	The upward force on a body that allows it to float or rise when submerged in a liquid
Vector	A quantity that has both magnitude and direction
Scalar	A quantity that has magnitude only
2. Constant Acceleration	
Velocity is the rate of change of ...	Displacement
Acceleration is the rate of change of ...	Velocity
$v =$	$u + at$
$s =$	$\left(\frac{u + v}{2}\right) t$
$v^2 =$	$u^2 + 2as$
$s =$	$ut + \frac{1}{2} at^2$
$s =$	$vt - \frac{1}{2} at^2$
$g =$	9.8 m s^{-2}
3. Forces and Motion	
$F =$	ma
$W =$	mg
Newton's 1 st law	An object at rest will stay at rest and an object moving with constant velocity will continue to move with constant velocity unless an unbalanced force acts on an object.
Newton's 2 nd law	The force needed to accelerate a particle is equal to the product of the mass of the particle and the acceleration produced. ($F=ma$)
Newton's 3 rd law	For every action there is an equal and opposite reaction.
4. Variable Acceleration	
$v =$	$\frac{ds}{dt}$
$a =$	$\frac{dv}{dt} = \frac{d^2s}{dt^2}$
$s =$	$\int v dt$
$v =$	$\int a dt$