

## Motion

### Velocity

- Constant Velocity is the rate of which an object moves in a fixed direction (m/s, or  $\text{ms}^{-1}$ )
  - o Amount of metres covered in the amount of seconds
- $\text{velocity } (\text{ms}^{-1}) = \frac{\text{change in position (m)}}{\text{change in time (s)}} = \frac{\Delta s}{\Delta t}$

### Acceleration

- Constant Acceleration is the rate at which velocity changes in a particular direction (m/s/s, or  $\text{ms}^{-2}$ )
  - o Amount of metres travelled in a second (velocity), every second
- $\text{acceleration } (\text{ms}^{-2}) = \frac{\text{change in velocity } (\text{ms}^{-1})}{\text{change in time (s)}} = \frac{\Delta v}{\Delta t}$

### Three Equations of Motion

- $v = u + at$
- $s = ut + \frac{1}{2}at^2$
- $v^2 = u^2 + 2as$

$v_i = u = \text{initial velocity (m/s)}$   
 $v_f = v = \text{final velocity (m/s)}$   
 $a = \text{acceleration (m/s/s)}$   
 $t = \text{time (s)}$   
 $s = \text{position (m)}$

### Newton's Laws of Motion

- All objects, which have no net force acting on them, will either remain stationary or continue to move in a straight line with constant velocity.
  - o Law of Inertia
- If there is a net force acting on an object then it will accelerate in the same direction as this force. The magnitude of this acceleration is directly proportional to the strength of the force and inversely proportional to its mass.
  - o  $F = ma$ , where F = force (N), m = mass (kg) and a = acceleration (m/s/s)
- The force acting between two bodies is actually two forces, both equal in magnitude but opposite in direction.
  - o Attraction between two objects

### Strings

- Tension is another name for a pulling force, so is measured in newtons
- $T = mg$ , where T = tension, m = mass and g = gravity

### Law of Conservation of Energy

- The **law of conservation of energy** is that no energy is lost or gained – it is only transferred.