

## Mechanics

**Acceleration** is the rate of change of velocity.

### **Newton's 1st Law of Motion**

Every object remains in its state of rest or uniform motion in a straight line unless it is acted upon by an external force.

### **Newton's 3rd Law of Motion**

For every action force acting on one object, there is an equal and opposite reaction force acting on another object.

### **Principle of Conservation of Energy**

Energy can neither be created nor destroyed in any process. It can only be converted from one form to another or transferred from one body to another but the total amount remains constant.

### **Principle of Moments**

For an object in equilibrium, the sum of the total clockwise moments about a pivot is equal to the sum of the total anticlockwise moments about the same pivot.

The **centre of gravity** of an object is the point through which its whole weight appears to act for any orientation of the object.

**Pressure** is the average force acting normally per unit area.

## Thermal Physics

### **Boyle's Law**

For a fixed mass of gas at constant temperature, pressure is inversely proportional to its volume.

### **Pressure Law**

For a fixed mass of gas at constant volume, pressure is directly proportional to its absolute temperature.

### **Charles' Law**

For a fixed mass of gas at constant pressure, volume is directly proportional to its absolute temperature.

**Brownian motion** is the continuous and random motion of suspended particles in a liquid or gas.

**Temperature** is a measure of the degree of hotness or coldness of a body.

The **specific heat capacity of a substance** is the amount of thermal energy required to change the temperature of 1 kg of a substance by 1 K (or 1°C).

The **specific latent heat of fusion** of a substance is the quantity of energy needed to change 1 kg of the substance from its solid state to liquid state at its melting point.

The **specific latent heat of vaporization** of a substance is the amount of energy required to change 1 kg of the substance from its liquid state to gaseous state at its boiling point.

## Optics

### **Laws of reflection**

- The incident ray, the reflected ray and the normal all lie in the same plane.
- The angle of incidence is equal to the angle of reflection, i.e.  $i = r$ .

## **Laws of refraction**

- The incident ray, the normal and the refracted ray at the point of incidence all lie in the same plane.
- For two particular media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant. i.e.  $n = \frac{\sin i}{\sin r}$  where  $n$  is a constant.

**Critical angle** is the angle of incidence in the optically denser medium for which the angle of refraction in the optically less dense medium is  $90^\circ$ .

**Total internal reflection** is the phenomenon where the angle of incidence is greater than the critical angle and the ray does not leave the glass at all where it is reflected internally within the medium.

**Focal length** is the distance between the optical centre and the principal focus.

## **Waves**

**Transverse waves** are ones in which the vibration of the particles is perpendicular to the direction of travel of the wave motion.

**Longitudinal waves** are ones in which the vibration of the particles is parallel to the direction of travel of the wave motion.

**Amplitude** of a wave is the maximum displacement of a particle of the medium from the zero position.

**Wavelength** is the distance between corresponding points on two successive waves.

**Frequency** is the number of waves produced every second by the source.

**Period** is the time taken for a complete wave.

**Wavefront** is an imaginary line on a wave that joins all points which have the same phase of vibration.

## **Electricity & Magnetism**

An **electric field** is the region in which an electric charge experiences a force.

A **line of force** in an electric field is the path along which a free positive charge would move.

**Current** is the rate of flow of charge.

The **potential difference** across a component in a circuit is the work done to drive a unit charge through the component.

**Electromotive force** of a source is the total energy dissipated by the source in driving one coulomb of charge round a complete circuit.

**Electrical resistance** of a conductor is the ratio of the potential difference across the conductor to current passing through it.

### **Ohm's law**

In a metallic conductor, the current flowing through it is directly proportional to the potential difference across its ends, provided that the physical conditions and temperature remain constant.

**Magnetic field** is the region around a magnet or a current where a magnetic force can be detected.

**Faraday's Law of Electromagnetic Induction** states that the magnitude of the induced electromotive force is directly proportional to the rate of change of magnetic flux linkage.

**Lenz's law** states that the induced current will flow in such a direction as to oppose the change producing it.