

DEFINITIONS

Linear Motion

Mass:

The mass of a body is the amount of matter in it.

Displacement:

The displacement of a body from a point is its distance from a point in a given direction.

Velocity:

The velocity of a body is its speed in a given direction.

OR

The velocity of a body is the rate of change of its displacement.

Acceleration:

The acceleration of a body is the change in velocity divided by the time taken.

OR

The acceleration of a body is its rate of change of velocity with respect to time.

Vectors and Scalars

Scalars:

Scalars are quantities which have magnitude only.

Vectors:

Vectors are quantities which have a magnitude and a direction.

Newton's Laws of Motion

Force:

A force is anything which causes a change in the velocity of a body.

Momentum:

The momentum of a body is its velocity multiplied by its mass.

Law 1:

A body will continue in a state of rest or at constant velocity unless an external force acts on it.

Law 2:

When an external force acts on a body, the change in momentum of the body is proportional to the force, and takes place in the direction of the force.

Law 3:

For every action there is an equal and opposite reaction. Action and reaction never act on the same body.

Friction:

Friction is any force which opposes motion.

Conservation of Momentum

The Law of Conservation of Momentum:

The Law of Conservation of Momentum states that in a collision between two or more objects, the total momentum of the bodies before the collision is equal to the total momentum afterwards, provided no external force acts.

Circular Motion

Centripetal Force:

A centripetal force is any force which keeps a body moving in a circle, and which always acts towards the centre of the circle.

Angular Velocity:

The angular velocity of a body is the rate of change of angle with respect to time. (**Angle must be in RADIANS.**)

Gravity

Newton's Law of Universal Gravitation:

The force of attraction between any two point masses is proportional to the product of their masses and inversely proportional to the square of the distance between them.

Weight:

The weight of a body is the force of gravity on it.

Period of a Satellite:

The period of a satellite is the time it takes to make one complete orbit.

Density and Pressure

Density:

The density of a substance is its mass per unit volume.

Pressure:

Pressure is the force per unit area.

Boyle's Law:

Boyle's Law states that the volume of a fixed mass of gas is inversely proportional to its pressure, at constant pressure.

Archimedes' Principle:

Archimedes' Principle states that when an object is partially or completely submerged in a fluid it experiences an upthrust equal in magnitude to the weight of the fluid displaced.

Moments

The Moment of a Force:

The moment of a force is the turning effect of the force.

Levers:

A lever is any rigid body free to rotate about a fixed point or line.

Couples:

A couple is a pair of parallel forces with the same magnitude but acting in opposite directions.

Torque:

The torque of a couple is the moment of that couple.

Conditions for Equilibrium

Equilibrium:

A body is in equilibrium if it is at rest (static equilibrium) or moving at constant velocity (dynamic equilibrium).

Work

Work:

Work is done when a force moves an object.

Definition of a Joule:

One joule is the amount of work done when a force of 1N acts for a distance of 1m in the direction of the force.

Energy

Energy:

Energy is the ability to do work.

Principle of Conservation of Energy:

The principle of conservation of energy states that energy can neither be created nor destroyed; it can only be changed from one form to another.

Renewable Sources of Energy:

Renewable energy sources are those which will not get used up.

Non-renewable Sources of Energy:

Non-renewable sources are those which will run out. (Fossil fuels)

Power

Power:

Power is the rate of doing work.

OR

Power is the rate at which energy is converted from one form to another.

Temperature

Temperature:

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

Thermometric Properties

Thermometric Property:

A thermometric property is any physical property that changes measurably with temperature.

Thermometers

Thermometers:

A thermometer is a device for measuring temperature.

Heat

Heat:

Heat is a form of energy, which, if added to a body causes a rise in temperature, or a fall in temperature if withdrawn.

Heat Capacity and Specific Heat Capacity

Heat Capacity:

The heat capacity of an object is the heat energy needed to change its temperature by 1 K (or by 1°C).

Specific Heat Capacity:

The specific heat capacity of an object is the heat energy needed to change the temperature of 1 kg of the substance by 1 K (or by 1°C).

Latent Heat and Specific Latent Heat

Latent Heat:

The latent heat of a substance is the heat required to change its state, without a change in temperature.

Specific Latent Heat:

The specific latent heat of a substance is the heat required to change the state of 1 kg of the substance, without a change in temperature.

Specific Latent Heat of Fusion of Ice:

The specific latent heat of fusion of ice is the heat required to change the state of 1 kg of ice to water (or water to ice), without a change in temperature.

Specific Latent Heat of Vaporisation of Water:

The specific latent heat of vaporisation of water is the heat required to change the state of 1 kg of water to steam (or steam to water), without a change in temperature.

Conduction

Conduction:

Conduction is the transfer of heat through a substance by vibration of molecules.

U – Values:

The U-Value of a substance is a measure of the rate at which heat is conducted through the structure.

Convection

Convection:

Convection is the transfer of heat through a fluid by means of the movement of the molecules of that fluid.

Radiation

Radiation:

Radiation is the transfer of heat in the form of electromagnetic radiation, without the need for a medium.

Solar Constant (Solar Irradiance):

The solar constant is the average amount of energy falling **per second** on **1m²** of the Earth's atmosphere. (1.35kWm⁻²)

Waves

Waves:

A wave is a means of transferring energy from one point to another.

Velocity:

The velocity of a wave is the distance travelled by one cycle (or by any part of the wave) in one second.

Wavelength:

The wavelength of a wave is the distance from one crest to the next or from one trough to the next.

Frequency:

The frequency of a wave is the number of cycles passing any point in one second.

Amplitude:

The amplitude of a wave is the maximum displacement of the medium from its normal position.

Transverse Waves:

A transverse wave is one where the wave travels at right angles to the direction of the vibrations.

Longitudinal Waves:

A longitudinal wave is one which the wave travels in the direction of the vibrations.

Wave Phenomena:

Reflection:

Reflection is the bouncing of waves off an obstacle in their path.

Refraction:

Refraction is the changing of direction of a wave when it crosses into a new medium.

Diffraction:

Diffraction is the spreading out of waves as they pass through a gap or around an obstacle.

Interference:

When two waves meet, they combine with one another to produce a new wave. The amplitude of the new wave is equal to the algebraic sum of the amplitudes of the individual waves.

Coherent Sources:

Two sources of waves are said to be coherent if they are in phase (or have a constant phase difference) and have the same frequency.

Polarisation:

A wave is polarised if its vibrations are confined to one plane only.

Stationary Waves:

When two periodic waves of the same amplitude and frequency, and travelling in opposite directions meet, they form a new wave called a **standing** wave or a **stationary** wave.

The Doppler Effect:

Stationary Waves:

The Doppler Effect is the apparent change in the frequency of a wave, due to the relative movement of the observer.

Resonance:

Natural Frequency:

The natural frequency of a body is the frequency with which the body freely tends to vibrate.

Resonance:

Resonance is the transfer of energy to a body vibrating at its natural frequency from another body vibrating at the same frequency.

Vibrations in Strings and Pipes:

Fundamental Frequency:

The fundamental frequency of a note is the frequency of the simplest mode of vibration.

Harmonics:

Harmonics are all multiples of the fundamental frequency.

Sound Intensity Level:

Sound Intensity (I):

The sound intensity (I) at a point is the rate at which sound energy is passing through an area 1m^2 , at right angles to the direction in which the sound is travelling at that point.

Threshold of Hearing:

The threshold of hearing is the lowest sound intensity which can be detected by a human ear at a frequency of 1 kHz.

Light – The Laws of Reflection:

Reflection:

Reflection of light is the bouncing of light off an object.

The Laws of Reflection:

1. The incident ray, the normal and the reflected ray are all on the same plane.
2. The angle of incidence is equal to the angle of reflection.

The Laws of Refraction:

Refraction:

Refraction is the bending of light as it passes from one medium to another.

The Laws of Refraction:

1. The incident ray, the refracted ray and the normal are all on the same plane.
2. The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for any two media. **This is Snell's Law.**

Refractive Index:

The refractive index of a medium is the ratio of the sine of the angle of incidence to the sine of the angle of refraction, when light enters the medium from a vacuum.

Total Internal Reflection:

Critical Angle (c):

The critical angle is the angle of incidence which corresponds to an angle of refraction of 90° for any given medium.

Total Internal Reflection:

When light is travelling from a dense to a rarer medium, and it strikes a boundary at an angle greater than the critical angle, all the light is reflected back into the

denser medium, this is known as total internal reflection.

Diffraction and Interference of Light:

Diffraction:

Diffraction is the spreading out of waves as they pass through a gap or around an obstacle.

Polarisation of Light:

Polarisation of Light:

Polarised light is light which vibrates in one plane only.

Dispersion of Light:

Dispersion:

Dispersion is the splitting up of white light into its constituent colours; red, orange, yellow, green, blue, indigo, violet. (Richard Of York Gave Battle In Vein.)

Colours:

Primary Colours:

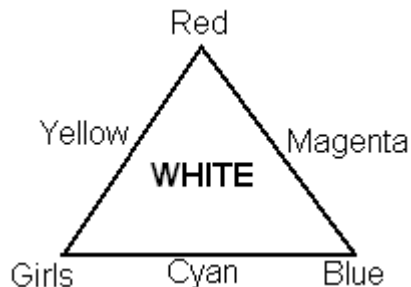
The primary colours of light are red, blue and green. Any other colours can be made by combining these. If they are mixed equally they produce white light.

Secondary Colours:

The secondary colours are made by mixing two primary colours equally. The secondary colours are cyan (turquoise), magenta and yellow..

Complimentary Colours:

Complimentary colours are a primary colour and a secondary colour which mix together to form white light.



Richard My Brother Calls Girls Young Women.

Charging by Friction:

Electric Charge:

An object becomes charged when it contains more than the usual number of electrons (negative charge), or less than the usual number of electrons (positive charge).

**Like charges repel :
Unlike Charges Attract**

Coulomb's Law and Electric Fields:

Coulomb's Law:

The force between two charged bodies is proportional to the product of the size of their charges and inversely proportional to the square of the distance between them.

Electric Field:

An electric field is any space in which a static electric charge (or charged particle) experiences a force (other than gravity).

Electric Field Lines:

An electric field line shows the direction in which a positive charge would move if it were placed in an electric field.

Electric Field Intensity (Strength), E :

The electric field strength, E , at a point in an electric field is the force that a +1 C charge would experience at that point.

Potential Difference:

Potential Difference (V):

The potential difference between two points is the work done (or energy lost) per unit charge to move a charge from one point to another.

The Volt:

One volt is the potential difference between two points if 1 joule of energy is used to transfer a +1C charge between the two points.

Capacitors and Capacitance:

Capacitance (C):

The capacitance of a conductor is the ratio of the charge on the conductor to its potential.

Electric Current

Electric Current (I):

An electric current is a flow of charge.

Sources of EMF

Electromotive Force (emf):

An emf is a voltage applied to a circuit.

Semiconductors

Semiconductors:

A semiconductor is a device whose conductivity is between that of a conductor and an insulator. The conductivity of a semiconductor increases as the temperature increases.

Doping:

Doping is the addition of impurities to a semiconductor to improve its conductivity.

Resistance

Resistance:

The resistance of a conductor is the ratio of the potential difference (voltage) across it to the current flowing through it.

The Ohm:

The resistance of a conductor is 1 Ω if a potential difference of 1 V across it produces a current of 1 A.

Ohm's Law:

Ohm's Law states that for certain conductors, the current flowing through them is proportional to the voltage across them provided the temperature remains constant.

Effects of Electric Current

Joule's Law:

Joule's Law states that the rate at which heat is produced in a conductor is proportional to the current squared, provided the resistance remains constant.

Magnetic Fields

Magnetic Field:

A magnetic field is the space around a magnet, in which the force can be felt.

Magnetic Field Lines:

Magnetic field lines show the direction in which a north pole would move, if it were placed at any point in a magnetic field.

Current Flowing In a Magnetic Field

A current-carrying conductor in a magnetic field experiences a force.

The direction of the force is at right angles to the magnetic field, and at right angles to the direction in which the current is flowing.

The Ampere:

The ampere (A) is that constant current, which if flowing in two infinitely long, parallel conductors of negligible cross-sectional area, 1m apart in a vacuum, would produce a force of 2×10^{-7} N per metre length on each conductor.

Electromagnetic Induction

Magnetic Flux (ϕ):

The magnetic flux through a loop of wire is defined as the magnetic flux density in the loop multiplied by the area of the loop.

Faraday's Law of Electromagnetic Induction:

When an emf is induced in a coil, the size of the induced emf is proportional to the rate of change of flux.

Lenz's Law:

When an induced current flows in a coil, the direction of the current is always such as to oppose the charge producing it.

A Generator:

A generator is a device which converts mechanical energy into electrical energy.

Alternating Current (a.c.)

Direct Current:

A direct current is one which flows in one direction only.

Alternating Current:

An alternating current is one which changes direction at regular intervals.

Alternating Current (a.c.)

Mutual Induction:

If two currents are placed close to each other, and changing current flows through one coil, an emf is induced in the second coil.

Self Induction:

When a current flowing in a coil of wire changes, a new emf is induced in it (a back emf), which opposes the changing current.

The Transformer:

The transformer is a device that is used to step-up (increase) or step-down (decrease) an alternating voltage.

The Atom

The Electronvolt (eV):

The electronvolt is the amount of energy gained or lost by an electron when it is accelerated through a voltage of 1 volt.

Thermionic Emission:

Thermionic emission is the giving off of electrons from the surface of a hot metal.

The Photoelectric Effect:

The Photoelectric Effect is the emission of electrons from the surface of a metal when electromagnetic radiation (light), above a certain frequency falls on the metal.

The Photon:

A photon is a packet of energy.

The Photocell:

A photocell is a device which allows a current to flow through it when light of a sufficient frequency falls on it.

X-Rays:

X-Rays are high frequency, high energy electromagnetic radiation, produced when fast electrons strike a metal target.

Emission Spectra:

The pattern that is formed by the light from a luminous source after it is dispersed is called an emission spectra.

LASER:

Light Amplification by Stimulated Emission of Radiation.

Atomic Number (Z):

The atomic number of an element is the number of protons in an atom of that element.

Mass Number:

The mass number of an element is the total number of protons and neutrons in an atom of that element.

Isotopes:

Isotopes are atoms of an element with the same atomic number but a different mass number.

Nuclear Physics

Radioactivity:

Radioactivity is the spontaneous disintegration of the nuclei of certain atoms, with the emission of one or more types of radiation.

Activity of a Substance:

The activity of a substance is the number of nuclei of that substance decaying each second.

Law of Radioactive Decay:

The number of nuclei decaying each second is proportional to the number of nuclei present.

Half-Life:

The half-life of a radioactive substance, $T_{1/2}$, is the time taken for half the nuclei present in a given sample to decay.

Fission:

Fission is the disintegration of a heavy unstable nucleus into two smaller nuclei with the release of large amounts of energy.

Fusion:

Fusion is the joining together of two smaller nuclei to form a large nuclei, releasing large amounts of energy.

Families of Particles

Leptons:

Leptons are particles which are not affected by the strong nuclear force.

Baryons:

Baryons are heavier particles which are affected by all forces.

Mesons:

Mesons are particles whose mass is between that of an electron and a proton, and who feels all four forces.

Quarks:

Quarks are the fundamental building blocks of baryons and mesons.