

PHYSICS TERMINOLGY, DEFINITIONS AND LAWS**MECHANICS**

The following should be familiar from Grade 11;

Newton's 1st Law A body will continue its state of rest or uniform velocity unless acted on by an external resultant force.

Inertia is that property of a body which must be overcome in order to produce an acceleration or deceleration OR the resistance of a body to change its state of motion. OR The property of an object that causes it to resist a change in its state of motion.

Newton's' 2nd Law states that the acceleration of a body is directly proportional to the resultant force and inversely proportional to the mass of the body and is in the direction of the resultant force. OR The acceleration produced by a net force on a body is directly proportional to the magnitude of the net force, and is inversely proportional to the mass of the body.

Alternative definition of Newton's 2nd Law The rate of change of momentum of a body is directly proportional to the RESULTANT force applied and is in the direction of the resultant force.

Newton's 3rd Law If body A exerts a force on body B then body B exerts an equal and opposite reaction force on body A.

Grade 12

The relative velocity of an object is the velocity as defined by a given observer OR the vector difference in the velocities of two objects.

A frame of reference is a coordinate system, which may be used to describe an object's position, orientation or movement.

The work done by a force is defined as the product of the displacement and the component of the force acting in the direction of the displacement, measured in Joules. ($W = F.s$) OR the amount of energy transferred by the force.

Kinetic energy (E_k) is the energy possessed by a body due to its motion. ($E_k = \frac{1}{2} mv^2$)

Gravitational potential energy (E_p) is the energy possessed by a body due to its position above the Earth's surface. ($E_p = mgh$)

Mechanical energy = kinetic energy + gravitational potential energy

Work-energy theorem – The work done by a **resultant** force on an object is equal to the change in its kinetic energy. ($W = F.s = \frac{1}{2} m.v^2$)

The Law of Conservation of Mechanical Energy – The total mechanical energy of a system remains constant provided no external force acts.

Power is the rate of doing work or the rate at which energy is expended, measured in Watts. ($P = W/t$)

The Law of Conservation of Momentum – The total momentum of an isolated system remains constant.

In an **elastic collision** kinetic energy is conserved.

In an **inelastic collision** kinetic energy is NOT conserved.

Impulse can be defined as the product of the net force acting on a body and the time for which it acts. Impulse produces a change in momentum (Impulse = $F.t$) OR the instantaneous change in momentum.

The resultant force acting on a body can be defined as

- (i) The vector sum of the forces acting on the body
- (ii) The rate of change of momentum. ($F = \Delta p/t$)
- (iii) The product of the mass of the body and its acceleration.

WAVES, SOUND & LIGHT

Dispersion is the separation of white light into the range of waves (different colours) that make up the visible spectrum. OR The separation of light into colours arranged according to their frequency.

Complementary Colours – any two colours of light that combine to produce white light (*eg magenta + green; yellow + blue; cyan + red*)

A **wavefront** is an imaginary line that connects waves that are in phase (e.g. all at the crest of their cycle).

Diffraction is the ability of a wave to spread as it passes through a small aperture or around a sharp edge.

Interference occurs when two waves pass through the same region of space at the same time, resulting in the superposition of waves.

Constructive interference occurs when two waves arrive at the same point **in phase**.

Destructive interference occurs when two waves arrive at the same point **out of phase**.

The **Doppler Effect** is the apparent change in the frequency of a wave when there is relative motion between the source of the wave and an observer.

A **shock wave** is a cone-shaped wave produced when the speed of the source (eg aircraft) is greater than the speed of the wave.

A "**sonic boom**" is the sound heard by an observer as a shockwave passes.

Mach number is the ratio of the speed of an object to the speed of sound through the medium in which the object moves.

The speed of an aeroplane is **subsonic** if its Mach number is less than 1, i.e. it is moving slower than the speed of sound.

The speed of an aeroplane is **supersonic** if its Mach number is greater than 1, i.e. it is moving faster than the speed of sound.

ELECTRICITY & MAGNETISM

Faraday's Law of Induction The magnitude of the induced emf is directly proportional to the rate of change of magnetic flux linkage.

DIODES

A **diode** is an electronic device that only allows current to flow through it in one direction in an electric circuit.

ELECTROMAGNETIC RADIATION

The Photoelectric Effect – When light of a particular frequency falls on certain metals, electrons are emitted. OR Ejection of electrons from certain metals when exposed to certain frequencies of light

The threshold frequency is the minimum frequency of light at which electrons will be emitted from a particular metal.

The minimum amount of energy needed to emit an electron from the surface of a metal is called the **work function** of the metal.