

TOPICS IN PHYSICS

International System of Units and use of prefixes

Distinction between vector and scalar quantities

MECHANICS

MOTION AND FORCE

Motion - velocity and acceleration

Free falling objects

Projectile motion - horizontally and vertically launched projectiles

Forces: contact and field forces

Weight

Newton's 1st, 2nd and 3rd law

Addition and resolution of forces

Contact forces: normal force and friction force

Work, kinetic energy, potential energy

Power

Conversion of mechanical energy

Uniform circular motion; centripetal acceleration and force

Distinction between vector and scalar quantities

RIGID-BODY

Rigid body definition

Resultant force acting on a rigid body

Free and fixed rigid body

Conditions for equilibrium of rigid body

Rigid body rotation: angular velocity, period and frequency

OSCILLATIONS AND WAVES

Periodic oscillations; simple harmonic oscillations and damped harmonic oscillations

Period of simple pendulum

Resonance

Wave motion, transverse and longitudinal waves

Properties of waves: wavelength, frequency, velocity

HYDROMECHANICS

Phases of matter

Density of a substance

Definition and units for pressure, hydrostatic pressure

Buoyant force and application of Archimedes' principle

Fluids in motion

Equation of continuity

Bernoulli's equation

THERMODYNAMICS

Temperature, kinetic theory of gases and molecular interpretation of temperature

Heat; specific heat capacity and heat capacity

Thermal equilibrium

Melting and hardening, melting point, latent heat of melting/hardening

Evaporation, boiling point, latent heat of vaporization/boiling

First and second law of thermodynamics

Thermal expansion of solids and liquids

The Ideal Gas Law

Application of equations for isothermal, isobaric and isochoric process

Adiabatic processes

ELECTROMAGNETISM

ELECTROSTATICS

Electric charge, Electric current, definition and units

Coulomb's force

Definition and units for the electric field and potential difference

ELECTRODYNAMICS

Ohm's law, electrical resistance, resistivity, conductivity

Definition and unit for capacitance

The capacitance of a parallel plate capacitor with or without dielectric

Equations for capacitors in series and in parallel

Application of Kirchhoff's rules

Equations for resistors connected in series and parallel

MAGNETISM AND ELECTROMAGNETISM

Magnets and magnetic fields

Magnetic field of straight wires supplied with electric current

Force on an electric current in a magnetic field and on electric charge moving in a magnetic field

Faraday's law of induction; Lenz's law

Alternating current

Transformers, the transformers equation

Capacitance in an AC circuit; calculation of capacitive reactance

Inductance in an AC circuit; calculation of inductive reactance

Electromagnetic waves and the electromagnetic spectrum, production of electromagnetic waves

OPTICS

The ray model of light

Reflection of light, formation of image by plane mirrors and spherical mirrors, total internal reflection

Refraction, Snell's law index of refraction

Thin lenses, focal point, focal length, optical power, ray tracing: converging and diverging lenses

The thin lenses equation; magnification

Huygens principle

Interference and diffraction of light

Polarization

ATOMIC AND NUCLEAR PHYSICS

Photoelectric effect

Structure of the atom. Bohr model and spectra of hydrogen atom

Structure and properties on the nucleus, nuclear size

Binding energy and nuclear forces

Radioactivity: alpha, beta and gamma decay

Nuclear reactions: conservation of nucleon number and charge

The law of radioactive decay; the half-life time of radioactive element

Nuclear reactions and transmutation of elements

Nuclear fission and fusion