

PHYSICS SYLLABUS

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Unit Chapter name Topics

1 Physics and measurement

Physics, technology, and society, S I Units, fundamental and derived units, least count, accuracy and precision of measuring instruments, Errors in measurement, Dimensions of Physics quantities, dimensional analysis, and its applications.

2 Kinematics

The frame of reference, motion in a straight line, Position- time graph, speed and velocity (Uniform and non-uniform motion), average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, Scalar and Vector quantity, Vector. Addition and subtraction, zero vector, scalar and vector products, Unit Vector, Resolution of a Vector. Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion.

3 Laws of motion

Force and inertia, Newton's First law of motion; Momentum, Newton's Second Law of motion, Newton's Third Law of motion, Impulse, Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction. Circular motion, centripetal force and its applications.

4 Work, Energy and Power

Work done by a constant force and a variable force, kinetic and potential energy, work-energy theorem, power, The potential energy of spring, conservation of mechanical energy, conservative and non conservative forces, Elastic and inelastic collisions in one and two dimensions.

5 Gravitation

The universal law of gravitation, Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion, Gravitational potential energy(gravitational potential), Escape velocity, Orbital velocity of a satellite. Geostationary satellites

6 Rotational motion

Center of the mass of a two-particle system, Center of the mass of a rigid body, Basic concepts of rotational motion(a moment of a force), torque, angular momentum, conservation of angular momentum and its applications(the moment of inertia), the radius of gyration, Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications, Rigid body rotation equations of rotational motion.

7 Properties of solids and liquids

Center of the mass of a two-particle system, Center of the mass of a rigid body, Basic concepts of rotational motion(a moment of a force), torque, angular momentum, conservation of angular momentum and its applications(the moment of inertia), the radius of gyration, Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications, Rigid body rotation equations of rotational motion. Elastic behavior, Stress-strain relationship, Hooke's Law,

Young's modulus, bulk modulus, modulus of rigidity, Pressure due to a fluid column, Pascal's law and its applications,
Viscosity, Stokes' law, Terminal velocity, streamline, and turbulent flow, Reynolds number,
Bernoulli's principle and its applications, Surface energy and surface tension, angle of contact,
application of surface tension(drops, bubbles, and capillary rise), Heat and temperature, thermal expansion,
specific heat capacity, calorimeter, change of state, latent heat, Heat transfer-conduction, convection, and radiation. Newton's law of cooling.

8 Thermodynamics

Thermal equilibrium, Zeroth law of thermodynamics,
the concept of temperature, Heat, work, and internal energy.
The first law of thermodynamics, The second law of thermodynamics
, reversible and irreversible processes, Carnot engine and its efficiency

9 Kinetic theory of gaseous

Equation of state of a perfect gas, work done on compressing a gas,
Kinetic theory of gasses - assumptions, the concept of pressure, Kinetic energy and temperature RMS speed of gas molecules:
Degrees of freedom, applications to specific heat capacities of gasses, Mean free path, Avogadro's number

10 Waves and Oscillations

Periodic motion - period, frequency, displacement as a function of time,
Periodic functions, Simple harmonic motion (S.H.M.) and its equation, phase oscillations of a spring restoring force and force constant,
energy in S.H.M. - Kinetic and potential energies, Simple pendulum derivation of expression for its time period, Free,
forced and damped oscillations, Resonance, Wave motion, Longitudinal and transverse waves, speed of a wave.
Displacement relation for a progressive wave. Principle of superposition of waves, a reflection of waves. Standing waves in strings and organ pipes, fundamental mode and harmonics. Beats, Doppler Effect in sound

11 Electrostatics

Electric charges: Conservation of charge. Coulomb's law, forces between two point charges, forces between multiple charges:
superposition principle and continuous charge distribution. Electric field (Electric field due to a point charge), Electric field lines, Electric dipole,
Electric field due to a dipole, Torque on a dipole in a uniform electric field, Electric flux, Gauss's law and its applications
To find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet, and uniformly charged thin spherical shell,
Electric potential and its calculation for a point charge, electric dipole and system of charges, Equipotential surfaces, Electrical potential energy of a system of two point charges in an electrostatic field,
Conductors and insulators, Dielectrics and electric polarization, capacitor, the combination of capacitors in series and parallel,
capacitance of a parallel plate capacitor with and without dielectric medium between the plates, Energy stored in a capacitor.

12 Current electricity

Electric current, Drift velocity, Ohm's resistance, Resistances of different characteristics of Ohmic and non-ohmic conductors
Electrical energy and power, Electrical resistivity, Color code for resistors Series and parallel

combinations of resistors;

Temperature dependence of resistance, Electric Cell and its Internal resistance, potential difference and the emf of a cell,

a combination of cells in series and parallel, Kirchhoff's laws and their applications, Wheatstone bridge, Meter Bridge, Potentiometer - principle and its applications.

13 Magnetic effect of current and Magnetism

Biot - Savart law and its application to the current carrying circular loop,

Ampere's law and its applications, to infinitely long current carrying straight wire and solenoid,

Force on a moving charge in uniform magnetic and electric fields, Cyclotron,

Force on a current-carrying conductor in a uniform magnetic field, force between two parallel currents carrying conductors-definition of ampere, torque experienced by a current loop in a uniform magnetic field:

Moving coil galvanometer and its current sensitivity, conversion to ammeter and voltmeter,

Current loop as a magnetic dipole and its magnetic dipole moment, Bar magnet as an equivalent solenoid,

magnetic field lines, Earth's magnetic field and magnetic elements, Paramagnetic, diamagnetic and ferromagnetic substances.

Magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.

14 Electromagnetic induction and A.C.

Electromagnetic waves and their characteristics, Transverse nature of electromagnetic waves,

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet. X-rays, Gamma rays), Applications of electromagnetic waves.

15 Optics

Reflection and refraction of light at plane and spherical surfaces, mirror formula,

Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification and Power of a Lens, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers,

Wave optics, wavefront and Huygens' principle, Laws of reflection and refraction using Huygens principle, Interference, Young's double-slit experiment and expression for fringe width, coherent sources, and sustained interference of light,

Diffraction due to a single slit, width of central maximum, Resolving power of microscopes and astronomical telescopes,

Polarization, plane polarized light: Brewster's law, uses of plane polarized light and Polaroid

16 Dual nature of matter and radiation

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations,

Einstein's photoelectric equation: particle nature of light, Matter waves-wave nature of particle, de Broglie relation. DavissonGermer experiment

17 Atoms and nuclei

Alpha-particle scattering experiment; Rutherford's model, Bohr model, energy levels,

hydrogen spectrum, Composition and size of nucleus, atomic masses, isotopes, isobars: isotones.

Radioactivity Alpha, beta and gamma particles and their properties, radioactive decay law,

Mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission, and fusion.

18 Electronic devices

Semiconductors; semiconductor diode, I-V characteristics in forward and reverse bias,

diode as a rectifier I-V characteristics of LED, the photodiode, solar cell, and Zener diode;

Zener diode as a voltage regulator, Junction transistor, transistor action, characteristics of a transistor: transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR. AND. NOT. NAND and NOR).

Transistor as a switch.

19 Communication System

Propagation of electromagnetic waves in the atmosphere, Sky and space wave propagation, Need for modulation, Amplitude and Frequency Modulation, Bandwidth of signals, the bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only)

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