

Syllabus of Combined Test (NEET Type) for PMT-Target Batches

Date: 28-02-2021 (Online & Offline Both)

PHYSICS

UNIT I: Physical World and Measurement

- **Physics:** Scope and excitement; nature of physical laws; Physics, technology and society.
- *Need for measurement:* Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.
- Dimensions of physical quantities, dimensional analysis and its applications.

UNIT II: Kinematics

• 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 and position-time graphs, for uniformly accelerated motion (graphical treatment). • Elementary concepts of differentiation and integration for describing motion. *Scalar and vector quantities:* Position and displacement vectors, general vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity. • Unit vectors. Resolution of a vector in a plane-rectangular components. • Scalar and Vector products of Vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration projectile motion. Uniform circular motion.

UNIT III: Laws of Motion

• Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. 46 • Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction, lubrication. • *Dynamics of uniform circular motion.* Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

UNIT IV: Work, Energy and Power

• Work done by a constant force and variable force; kinetic energy, work-energy theorem, power. • Notion of potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); nonconservative forces; motion in a vertical circle, elastic and inelastic collisions in one and two dimensions.

UNIT V: Motion of System of Particles and Rigid Body

• Centre of mass of a two-particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod.

• Moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

• Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions, moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorem and their applications.

UNIT VI: Thermodynamics

- Thermal equilibrium and definition and temperature (Zeroth Law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes.
- Second law of thermodynamics : Reversible and irreversible processes. Heat engines and refrigerators.

UNIT VII: Behaviour of perfect gas and kinetic theory

- Equation of state of a perfect gas, work done on compressing a gas.
- Kinetic theory of gases : Assumptions, concept of pressure, kinetic energy and temperature, Degrees of freedom, law of equipartition of energy (statement only) application of specific heat capacities of gases, concept of mean free path.

UNIT VIII: Heat transfer, expansion, calorimetry

- Heat, temperature, thermal expansion, thermal expansion of solids, liquid and gases. Anomalous expansion.
Specific heat capacity : C_p , C_v – calorimetry, change of state – latent heat.
- Heat transfer – conduction and thermal conductivity, convection and radiation. Qualitative ideas of block body radiation, Wein's displacement law, and green house effect.
- Newton's law of cooling and Stefan's Law.

UNIT IX : Electrostatics

- Electric charges and their conservation. Coulomb's law-force 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, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside) • Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges: equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipoles in an electrostatic field. Conductor and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor, Van de Graaff generator.

UNIT X : Current Electricity

- Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current; Ohm's law, electrical resistance, $V-I$ characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. • Carbon resistors, color code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance.
- Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. • Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge.
- Potentiometer-principle and applications to measure potential difference, and for comparing emf of two cells; measurement of internal resistance of a cell.

UNIT XI : Optics

• Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact combination of a lens and a mirror. Refraction and dispersion of light through a prism. • Scattering of light- blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Wave optics : wave front and Huygens Principle, reflection and refraction of plane wave at a plane surface using wavefront.

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. Polarisation, plane polarized light, Brewster's law, uses of plane polarized light and polaroids.

UNIT XII : Dual Nature of Matter and Radiation

• Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation- particle nature of light. • Matter waves- wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained).

UNIT XIII : Atoms and Nuclei

• Alpha- particle scattering experiments; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. • Radioactivity- alpha, beta and gamma particles/ rays and their properties decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

CHEMISTRY

Mole concept, solution, atomic structure, chemical kinetics, solid state, chemical equilibrium, hydrocarbon, nomenclature of organic compounds. General organic chemistry, alkyl/aryl halide, isomerism in organic compound, alcohol, phenol and ether, aldehyde, ketone, periodic table, chemical bonding, p and d block element.

BOTANY

The living world, biological classification, plant kingdom, morphology of flowering plants and anatomy of flowering plants, respiration and photosynthesis, plant growth and development, mineral nutrition, cell the unit of life, cell cycle and cell division.

ZOOLOGY

Animal kingdom, animal tissue, cockroach, digestion and absorption, breathing and exchange of gases, body fluid and circulation, excretory products and their elimination, locomotion and movement, Neural control and coordination.