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SYLLABUS 2026–27

PHYSICS

As prescribed by the National Medical Commission (NMC)

20 Units • 45 Questions • 180 Marks

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PHYSICS

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UNIT 01 PHYSICS AND MEASUREMENT

- Units of measurements, System of Units, SI Units, fundamental and derived units, least count, significant figures, errors in measurements, dimensions of physical quantities, dimensional analysis and its applications.

UNIT 02 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 and position–time graphs, relations for uniformly accelerated motion.
- Scalars and vectors, vector addition and subtraction, scalar and vector products, unit vector, resolution of a vector.
- Relative velocity, motion in a plane, projectile motion, uniform circular motion.

UNIT 03 LAWS OF MOTION

- Force and inertia, Newton's First law of motion; momentum, Newton's Second Law of motion, impulse; Newton's Third Law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces.
- Static and kinetic friction, laws of friction, rolling friction.
- Dynamics of uniform circular motion: centripetal force and its applications – vehicle on a level circular road, vehicle on a banked road.

UNIT 04 WORK, ENERGY AND POWER

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

UNIT 05 ROTATIONAL MOTION

- Centre of mass of a two-particle system, centre of mass of a rigid body; basic concepts of rotational motion; 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. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

UNIT 06 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, motion of a satellite, orbital velocity, time period and energy of a satellite.

UNIT 07 PROPERTIES OF SOLIDS AND LIQUIDS

- Elastic behaviour, 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. Effect of gravity on fluid pressure.
- Viscosity. Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity. Bernoulli's principle and its applications.
- Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension – drops, bubbles and capillary rise.
- Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer – conduction, convection and radiation.

UNIT 08 THERMODYNAMICS

- Thermal equilibrium, zeroth law of thermodynamics, the concept of temperature. Heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes.
- The second law of thermodynamics: reversible and irreversible processes.

UNIT 09 KINETIC THEORY OF GASES

- Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases – assumptions, the concept of pressure. Kinetic interpretation of temperature; RMS speed of gas molecules; degrees of freedom. Law of equipartition of energy and applications to specific heat capacities of gases; mean free path. Avogadro's number.

UNIT 10 OSCILLATIONS AND WAVES

- Oscillations and periodic motion – time 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.
- Wave motion. Longitudinal and transverse waves, speed of a travelling wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves. Standing waves in strings and organ pipes, fundamental mode and harmonics. Beats.

UNIT 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; potential difference, equipotential surfaces, electrical potential energy of a system of two point charges and of an electric dipole in an electrostatic field.
- Conductors and insulators. Dielectrics and electric polarization, capacitors and capacitance, 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.

UNIT 12 CURRENT ELECTRICITY

- Electric current. Drift velocity, mobility and their relation with electric current. Ohm's law. Electrical resistance. V–I characteristics of ohmic and non-ohmic conductors. Electrical energy and power. Electrical resistivity and conductivity. Series and parallel combinations of resistors; temperature dependence of resistance.
- Internal resistance, potential difference and emf of a cell, combination of cells in series and parallel. Kirchhoff's laws and their applications. Wheatstone bridge. Metre bridge.

UNIT 13 MAGNETIC EFFECTS OF CURRENT AND MAGNETISM

- Biot–Savart law and its application to a current-carrying circular loop. Ampere's law and its applications to an infinitely long current-carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields.
- Force on a current-carrying conductor in a uniform magnetic field. The force between two parallel current-carrying conductors – definition of ampere. Torque experienced by a current loop in a uniform magnetic field; moving coil galvanometer, its sensitivity and 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; magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole in a uniform magnetic field. Para-, dia- and ferromagnetic substances with examples, effect of temperature on magnetic properties.

UNIT 14 ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

- Electromagnetic induction: Faraday's law. Induced emf and current; Lenz's Law, eddy currents. Self and mutual inductance. Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit, resonance; power in AC circuits, wattless current. AC generator and transformer.

UNIT 15 ELECTROMAGNETIC WAVES

- Displacement current. Electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays), applications of e.m. waves.

UNIT 16 OPTICS

- Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula. Total internal reflection and its applications. Magnification. Power of a lens. Combination of thin lenses in contact. Refraction of light through a prism. 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. Polarization, plane-polarized light; Brewster's law, uses of plane-polarized light and Polaroid.

UNIT 17 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.

UNIT 18 ATOMS AND NUCLEI

- Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass–energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19 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. Logic gates (OR, AND, NOT, NAND and NOR).

UNIT 20 EXPERIMENTAL SKILLS

Familiarity with the basic approach and observations of the experiments and activities:

1. Vernier calipers – its use to measure the internal and external diameter and depth of a vessel.
2. Screw gauge – its use to determine thickness/diameter of thin sheet/wire.
3. Simple pendulum – dissipation of energy by plotting a graph between the square of amplitude and time.
4. Metre scale – the mass of a given object by the principle of moments.
5. Young's modulus of elasticity of the material of a metallic wire.
6. Surface tension of water by capillary rise and effect of detergents.
7. Coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
8. Speed of sound in air at room temperature using a resonance tube.
9. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
10. The resistivity of the material of a given wire using a metre bridge.
11. The resistance of a given wire using Ohm's law.
12. Resistance and figure of merit of a galvanometer by half deflection method.
13. The focal length of (i) convex mirror, (ii) concave mirror and (iii) convex lens, using the parallax method.
14. The plot of the angle of deviation vs angle of incidence for a triangular prism.
15. Refractive index of a glass slab using a travelling microscope.
16. Characteristic curves of a p-n junction diode in forward and reverse bias.
17. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
18. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items.