

WBJEE 2014 SYLLABUS FOR PHYSICS

1. Mechanics & General properties of matter

(i) Units and dimensions : Units of measurement, system of units, fundamental and derived units, S I units, dimensional analysis

Methods of measurement: Vernier scale, screw gauge, analysis of errors, significant figures.

(ii) Scalars and vectors: Addition, subtraction, multiplication of vectors

(iii) Kinematics in one, two and three dimensions, projectiles, uniform circular motion, centripetal force, centrifugal force, relative velocity

(iv) Dynamics: Newton's laws of motion; inertial frames, uniformly accelerated frame (pseudo-forces), conservation of linear momentum, rocket motion, centre of mass, impulsive forces, friction.

(v) Work, Power and Energy, conservative and non-conservative forces, conservation of energy, collision (elastic and inelastic).

(vi) Rotational motion : Torque, angular momentum and conservation of angular momentum, moment of inertia, radius of gyration, moment of inertia of objects with simple geometrical shapes, rotational kinetic energy and rolling on horizontal surface

2. Gravitation: Laws of gravitation, gravitational field and potential, acceleration due to gravity and its variation, escape velocity, Kepler's laws and planetary motion, motion of satellites, Geostationary orbit. Elasticity: Hooke's law, elastic moduli, Poisson's ratio, elastic energy.

3. Hydrostatics and Fluid Mechanics: Pressure in a fluid, Pascal's law, Archimedes' principle, hydraulic press. Surface energy and surface tension, capillary rise. Viscosity, streamline and turbulent motion, critical velocity, Reynold's number, Stoke's law, Bernoulli's theorem.

4. Vibrations: Simple Harmonic Motion, equation of motion, damped and forced vibrations, resonance, superposition of SHM.

5. Wave motion: Elastic waves, longitudinal and transverse waves, progressive waves, superposition of waves: interference, stationary waves, beats, vibration of strings, air columns, velocity of elastic waves in different media, Doppler effect.

6. Thermal Physics: Scales of temperature, thermal expansion of solids, liquids and gases, calorimetry, change of state of matter, latent heat, transition temperature, Transmission of heat: conduction, convection, radiation, Black body radiation, absorptive and emissive powers: Kirchoff's law, Wien's law, Stefan's law, Newton's law of cooling, Kinetic theory: mean free path, pressure of an ideal gas, mean and rms velocity of molecules of a Gas, kinetic interpretation of temperature, degrees of freedom, equipartition of energy (statement only) application to mono atomic and diatomic gases.

7. Thermodynamics: First law of thermodynamics, equivalence of heat and work, intensive and extensive thermodynamic variables, reversible and irreversible processes, specific heats of gases, relation between C_p and C_v .

8. Optics: Reflection and refraction at plane and spherical surfaces, total internal reflection, thin lenses, power of a lens, combination of lenses and mirrors, deviation and dispersion by prisms, Simple and compound microscopes, astronomical telescope, human eye: defects and remedies. Coherent sources, interference of light, Young's double slit.

9. Electrostatics: Coulomb's law, electric field and potential, flux of electric field, Gauss' law, electric field and potential due to an infinite line charge, charged infinite sheet, solid spheres and spherical shells. Electric dipole and field due to dipole. Capacitance, spherical and parallel plate capacitors, energy stored in a capacitor, series and parallel combination of capacitors.

10. Current Electricity: Electric current, drift velocity and mobility. Ohm's law, resistivity, combination of resistances in series and parallel, combination of cells.

Kirchoffs laws, Wheat stone bridge, Metre bridge, potentiometer.
Heating effect of current, thermoelectricity, see beck and Peltier effect.
Chemical effect of current, Faraday's law of electrolysis, primary and secondary cells.

11. Electromagnetism: Magnetic effects of Current, Biot Savart's law, magnetic field due to an infinite line charge, circular coil and solenoid, Ampere's circuital law, Lorentz force, Fleming's left hand rule, force between two current carrying conductors, magnetic moment of a current loop, magnetic dipole, torque experienced by a current carrying coil in a uniform magnetic field, galvanometer, current sensitivity, conversion of galvanometer to voltmeter and ammeter.
Magnetic field of earth. tangent galvanometer, magnetic properties of materials : Dia, para and ferromagnet, permeability, susceptibility.
Electromagnetic induction : Magnetic flux, Faraday's laws of electromagnetic induction, Lenz's law, self and mutual induction, , Flemings right hand rule, Alternating current, peak and rms value of alternating current; generator, D.C. motor and transformer
Qualitative idea of electromagnetic wave and its spectrum.

12. Modern Physics: Bohr's atomic model for hydrogen like atom, hydrogen spectrum, x-ray emission, Moseley's law, wave particle duality, de Broglie's hypothesis, photo-electric effect .
Constituents of atoms, isotopes, mass defect, mass-energy equivalence, binding energy. radioactivity – α , β , γ radiation, half life, mean life, fission, fusion.
Energy bands in solids, intrinsic and doped semiconductors, p-n junction diode, rectifier, pnp and npn transistors, common emitter characteristics.
Binary number, AND, OR, NOT, NAND and NOR gates.