



Download Bihar Public Service Commission (BPSC Mains)

Optional Subject - Physics

PHYSICS

Section-I

Mechanics, Thermal Physics and Wave and Oscillations

1. Mechanics:

Conservation Laws. Collisions, impact parameter, scattering cross-section. Centre of mass and Lab-systems with transformation of physical quantities, Rutherford Scattering. Motion of a rocket under constant force field. Rotating frames of reference, Coriolis force, Motion of rigid bodies, Angular momentum, Torque and precession of a top, Gyroscope. Central forces, Motion under inverse square law, Kepler's Laws, Motion of Satellites (including geostationery). Galilean Relativity, Special Theory of Relativity, Michelson-Morley Experiment, Lorentz Transformation – addition theorem of velocities, Variation of mass with Velocity, Mass Energy equivalence, Fluid dynamics, streamlines, turbulence, Bernoulli's Equation with simple applications.

2. Thermal Physics:

Laws of thermodynamics, Entropy, Carnot's cycle, Isothermal and Adiabatic changes, Thermodynamic Potentials Maxwell's relations. The Clausius-Clapeyron equation reversible cell, Joule-Kelvin effect etc. Planck's Law, Kinetic Theory of Gases, Maxwell's Distribution Law of velocities, Equipartition of energy, Specific heats of gases Mean free path, Brownian Motion. Black body radiation, specific heat of solids – Einstein and Debye theories, Wien's Law, Planck's Law, solar constant. Thermal ionization and Stellar spectra. Production of low temperatures using adiabatic demagnetization and deduced refrigeration, concept of negative temperature.

3. Waves and Oscillations:

Oscillations, Simple harmonic motion, stationary and travelling waves, Damped harmonic motion, forced oscillation and Resonance. Wave equation, harmonic Solutions, Plane and Spherical waves, Superposition of waves, phase and group velocities, Beats. Huygen's principle, Interference. Diffraction-Fresnel and Fraunhofer. Diffraction by straight edge, single and multiple slits, Resolving power of grating and Optical Instruments. Rayleigh Criterion. Polarization, Production and detection of polarized light (linear, circular and elliptical). Laser sources (Helium-Neon, Ruby and semiconductor diode) Concept of spatial and temporal coherence diffraction

as a fourier transformation. Fresnel and Fraunhofer diffraction by rectangular and circular apertures, Holography; theory and applications.

Section- II

(Electricity and Magnetism, Modern Physics and Electronics)

1. Electricity and Magnetism:-

Columb's Law, Electric field. Gauss's law, Electric-potential Poisson and Laplace equation for a homogeneous dielectric, uncharged conducting sphere in a uniform field, point charge and infinite conducting plane. Magnetic field Magnetic induction and field strength. Biot-Savart law and applications. Electromagnetic induction, Faraday's and Lenz's laws, self and mutual inductances. Alternating currents. L.C.R. circuits series and parallel resonance circuits, quality factor. Kirchhoff's laws with application. Maxwell's equations and electromagnetic waves, Transverse nature of electromagnetic waves, Poynting vector. Magnetic fields in matter – diamagnetic, paramagnetic, ferroantiferromagnetic and ferromagnetism (qualitative approach only).

2. Modern Physics:

Bohr's theory of hydrogen atom. Electron spin, optical and X-ray Spectra. Stern – Gerlach experiment and spatial quantization. Vector model of the atom, spectral terms, fine structure of spectral lines. J-J and L.S coupling Zeeman effect, Pauli's exclusion principle, spectral term of two equivalent and non equivalent electrons. Gross and fine structure of atomic band Spectra. Raman effect. Photoelectric effect. Compton effect, de Broglie waves. Wave particle duality and uncertainty principle. Schrödinger wave equation with application to (i) particle in a box (ii) motion across a step potential, one dimensional harmonic oscillator eigen values and eigen functions. Uncertainty Principle Radioactivity, Alpha, Beta and Gamma radiations. Elementary theory of the alpha decay. Nuclear binding energy. Mass spectroscopy, Semi empirical mass formula. Nuclear fission and fusion. Elementary Reactor physics Elementary particle their classification. Strong and weak electromagnetic interactions. Particle accelerators; cyclotron. Linear accelerators. Elementary ideas of super conductivity.

3. Electronics:

Band theory of Solids- Conductors, insulators and semiconductors. Intrinsic and extrinsic semiconductor P.N junction, Thermistor, Zener diodes reverse and forward biased P. N Junction, Solar cell use of diodes and transistors for rectification,

amplification, oscillation, modulation and detection of r.f. waves. Transistor receiver, Television Logic Gates.