JAGRAN Josh
your guide to success

WWW.JAGRANJOSH.COM

Physics Syllabus for Uttarakhand State Civil Services Main Exam-2011

PHYSICS

PAPER-I

MECHANICS, THERMAL PHYSICS AND WAVES & OSCILLATIONS

1. Mechanics: Conservation law. 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, Dynamics of rotating bodies, Motion of charged particles under electric and magnetic fields, Lorentz force, Moment of inertia, Theorem of parallel and perpendicular axes. Moment of inertia of sphere, ring, cylinder, disc. Angular momentum, Torque and Precession of a top, Gyroscope. Central forces. Motion under inverse square law, Kepler's Laws, Motion of Satellites (including geostationary). Galilean Relativity, Special Theory of Relativity, Michelson-Morley experiment, Lorentz Transformations-addition theorem of velocities. Variation of mass with velocity, Mass-Energy equivalence. Fluid dynamics, steamlines, Reynold number, Viscosity, Poiseulle's formula for the flow of liquid through narrow tubes, turbulance, Bernoulli's Equation with simple applications.

2. Thermal Physics: Laws of thermodynamics, Entropy, Carnot's cycle, Isothermal and Adiabatic changes, Thermodynamic Potentials, Helmboltz and Gibbs functions, Maxwell's relations. The Clausius-Clapeyorn equation, Reversible Carnotd cycle, Head Engine and Effeciency, Joule-Kelvin effect, Stefan-Boltzmann 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, Wein's Law, Planck's Law, solar constant. Saha's theory of thermalionization and Stellar spectra. Production of low temperatures using adiabatic demagnetization and dilution refrigeration. Concept of negative temperature.

3. Waves and Oscillations: Oscillations, simple harmonic motion. Example of simple harmonic motion: Mass, spring and LC circuits. Stationary and traveling waves, Damped harmonic motion, Forced oscillation and Resonance. Sharpness of resonance. Wave equation, harmonic solutions, plane and spherical waves, super position of waves, Two perpendicular simple harmonic motions-Lissajous figures, Fourier analysis of periodic waves-square and triangular waves. Phase and Group velocities, Beats, Huygen's principle. Division of amplitude and wavefront, Fresnel biprism, Newton's rings, Michelson interferometer Fabry-Perot interferometer. Diffraction-Fresnel and Fraunhofer. Diffracton as Fourier Transformation. Fresnel and Fraunhofer diffraction by rectangular and circular apertures. Diffraction by straightedge, Single and multiple slits. Resolving power of grating and Optical Instruments. Rayleigh Criterion, Polarization, production and detection of polarized light (linear, circular and elliptical). Brewster's law, Huyghen's theory of double refraction, optical rotation, polarimeters. Laser sources (Helium-Neon, Ruby, Nd. YAG and semi-conductor diodes). Concept of spatial and temporal coherence. Holography, theory and applications.

PAPER-II

ELECTRICITY AND MAGNETISM, MODERN PHYSICS AND ELECTRONICS

1. Electricity and Magnetism: Coulomb's Law, Electric Field. Gauss's Law, Electric potential. Poission and Laplace equations for homogeneous dielectrics, uncharged conducting sphere in a uniform field. Electric field due to a point charge and infinite conducting place. Current electricity: Kirchoff's laws and its applications: Wheatstone bridge, Kelvin's double bridge, Carey-Foster's bridge. Bio-Savart law and its applications. Ampere's circuital law and its applications, Magnetic induction and field strength, Magnetic shell, Magnetic field on the axis of a circular coil. Helmbotz coil. Electromagnetic induction, Faraday's and Lenz's law, Self and Mutual inductances, Alternating currents. L.C.R. circuits, series and parallel resonance circuits, quality factor. Maxwell's equations and electromagnetic waves. Transverse nature of electromagnetic waves, Poynting vector. Magnetic fields in matter: Dia, Para, Ferro, Antiferro and Ferrimagnetism (qualitative approach only). Hysteresis.

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 couplings. Zeeman effect, Pauli's exclusion principle, spectral terms of two equivalent and non-equivalent electrons. Gross and fine structure of electronic band spectra. Raman effect, Photoelectric effect. Compton effect, de Broglies wave. Wave Particle duality, Uncertainity principle. Postulates of quantum mechanics. Schrodinger wave equation with application to (i) particle in a box, (ii) motion across a stem potential, (iii) one dimensional harmonic oscillator, Eigen values and Eigen functions. Radioactivity, alpha, beta 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 particles and their classification, strong, weak and electromagnetic inferactions. Particles accelerators, cyclotron. Linear accelerators. Elementary ideas of Superconductivity.

3. Electronics: Band theory of solids, conductors, insulators and semiconductors. Intrinsic and extrinsic semiconductors, 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 and their truth tables, some applications.