Download Uttar Pradesh Public Service Commission (UPPCS Mains) Exam Syllabus

Optional Subjects

Physics

:: PAPER - I ::

Mechanics, Thermal Physics, Waves & Oscillations and Optics

1. Mechanics: Conservation law, collisions, impact parameter, scattering cross- section, centre of mass and lab systems with transformation of physical quantities, Rutheford Scattering. Motion of a rocket under constant force field. Rotating frames of reference, Coriolis force, Motion of rigid bodies, Dynamics of rotating bodies. Inertia tensor, Moment of inertia, 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). Elastic constants and their interrelationship, Galilean Relativity. Special Theory of Relativity. Michelson-Morely Experiment, Lorentz Transformations-addition of velocities. Variation of mass with velocity. Mass- Energy equivalence. Fluid dynamics. Streamline and turbulent flow, Reynold number, Viscosity, Poiseulle's formula for the flow of liquid through narrow tubes, Bernoulli's equation with simple applications.

2. Thermal physics: Laws of thermodynamics, Entropy, Canot's cycle, Isothermal and Adiabatic changes, thermodynamic Potentials, Helmboltz and Gibbs functions. Maxwell's relations. The Clausius-Clapeyron equation, reversible cell, joule-Kelvin effect, Stefan Boltzmann Law, Kinetic Theory of Gasses, 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. Weins Law, Planck's Law, solar constant. Saha's theory of thermal ionization and stellar spectra, Production of low temperatures using adiabatic demagnetization and dilution refrigeration. Concept of negative temperature.

3. Waves and Oscillations: Simple harmonic motion, mass, spring and LC circuits. Stationary and progressive waves, Damped harmonic motion, forced oscillation and Resonance, Sharpness of resonance, Wave equation, Harmonic solutions, Plane and Spherical waves, Superposition of waves. Two Prependicular simple harmonic motions. Lissajous figures, fourier analysis of periodic waves-square and triangular waves. Phase and Group velocities, Beats.

4. Optics: Huygen's principle, Division of amplitude and wave front, Fresnel Biprism, Newton's rings, Michelson interferometer, Fabry-Perot inter-ferometer. Diffraction-Fresnel and Fraunhoffer's

Diffraction as a Fourier Transformation. Fresnel and Fraunhoffer diffraction by rectangular and circular apertures. Diffraction by straight edge, Single and multiple slits.

Resolving power of grating and optical instruments. Rayleigh crirterion. Polarization, Production and Detection of polarized light (Linear, circular and elliptical) Brewster's law, Huygen's theory of double refraction, optical rotation, polarimeters. Laser sources (Helium-Neon, Ruby and semi conductor diode). Concept of spatial and temporal coherence. Holography, theory and application, Doppler effect.

:: PAPER - II ::

Electricity and Magnetism, Modern physics and Electronics

1. Electricity and Magnetism: Coulomb's Law, Electric Field, Gauss's Law and applications, Electric Potential, Poisson and Laplace equations for homogeneous dielectric, uncharged conducting sphere in a uniform field, point charge and infinite conducting plane. Bio-Savart law and applications. Ampere's circuital law and its applications, Magnetic induction and field strength, Magnetic shell, Magnetic field on the axis of circular coil, Helmholtz coil, Electromagnetic induction, Faraday's and Lenz's law, self and mutual inductances. Current electricity, Kirchoff's laws and its applications; Wheatstone bridge, Kelvin's double bridge, Carey foster's bridge 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, Stern-Gerlach experiment and spatial quantization, Vector model of the atom spectral terms, Optical and X-Ray Spectra, fine structure of spectral lines. J-J and L-S coupling 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-Broglie waves. Wave Particle duality, uncertainty principle, postulates of quantum machanics. Schrodinger wave equation and application. (i) particle in a box. (ii) motion across a step potential, One dimensional harmonic oscillator, eigen values and eigen functions. 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 particles and their classification, strong and weak interactions. Particle accelerators, cyclotron. Linear accelerators. Elementary ideas of superconductivity.

3. Electronics: Classification of solids into conductors, insulators and semiconductors on the basis of energy bands. Intrinsic and extrinsic semiconductors, P.N. junction, Reverse and forward based P.N. junction, Thermistor, Zener diode, solar cell. Use of diodes and transistors for rectification, amplification, oscillation, modulation and detection of r.f. waves. Transistor receiver. Boolean Algebra, Logic Gates and their truth table, some applications, Adder and subtractor.

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