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Physics Syllabus for Uttarakhand State Civil Services
Preliminary Exam-2011

PHYSICS

1. **Mechanics:** Units and dimensions. S.I. Units, Newton's laws of motion, Conservation of linear and angular momentum, Projectiles, Rotational motion, Moment of inertia, Newton's law of gravitation, Gravitational field and potential, planetary motion, Kepler's laws, Artificial satellite, Fluid motion, Bernoulli's theorem and its applications. Surface tension, Excess pressure, Viscosity, Stoke's law, Elastic constants and their interrelation. Bending of beam, Torsion of cylindrical bodies, Elementary idea of special theory of relativity and simple applications. Michelson-Morley experiment, Lorentz transformation. Mass-energy relation and its equivalence.
2. **Thermal Physics:** Thermometry, Zeroth, First and second laws of thermodynamics, Heat engine, Entropy, Thermodynamical potential, Maxwell's relations, Kinetic theory of gases, Ideal gas equation, Brownian motion, Maxwell's velocity distribution, Equipartition of energy, Mean free path, Transport phenomena. Vander-Waal's equation of state, Critical constants. Black body radiation, Wien's and Rayleigh Jeans law, Stefan-Boltzmann law, Planck's law. Specific heat of solids, Heat conduction in solids.
3. **Waves and Oscillation:** Simple harmonic motion, Wave motion, Travelling wave, Superposition of waves, Standing waves, Beats, Composition of two perpendicular simple harmonic motions and Lissajous figures. Damped oscillations in mechanical and electrical systems. Forced oscillations and resonance. Simple oscillatory systems: Vibration of rods, strings and air columns. Doppler effect, Ultrasonics, Fourier analysis of simple periodic waves (rectangular and saw-tooth)
4. **Optics:** Nature and propagation of light, Interference, Division of wave-front and amplitude, Newton's rings, Fresnel bi-prism, Simple interferometers. Diffraction, Fraunhofer and Fresnel diffraction, Gratings, Zone plate. Determination of wavelength of spectral lines. Polarization of light, Brewster's law, Production and detection of polarized light, Electromagnetic spectrum, Rayleigh scattering, Raman effect. Laser, Coherence, Population inversion, He-Ne laser.
Thin lens formula, Cardinal points, combination of coaxial thin lenses, spherical and chromatic aberrations and their corrections. Optical instruments, eye-pieces, microscopes, telescopes, Rayleigh's criterion of resolving power, Resolving power of optical instruments.
5. **Electricity and Magnetism:** Electric charge, field and potential, Electric dipole, Gauss' law and its applications. Dielectrics, Capacitance, Electric current, Ohm's law, Kirchhoff's law. Wheatstone's bridge and its applications, Potentiometer. Biot-Savart's law. Motion of charged particle in magnetic field, Hall effect, moving coil galvanometer. Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance and their applications. Alternating current, LCR circuits, Reactance, Impedance, Dynamo, Motors, Thermoelectricity. Seebeck, Peltier and Thomson effects and their applications, Electromagnetic waves: Maxwell's equations, Hertz experiment. Particle accelerators, Cyclotron, Betatron. Mass spectrometers. Dia, para and ferro- magnetism.
6. **Modern Physics:** Measurement of electronic charge and specific charge e/m , Measurement of Planck's Constant, Rutherford atomic model, Bohr's theory of hydrogen atom, Optical and X-ray spectra, Bragg's law, Mosley's law. Photo-electric and Compton effects. Wave nature of matter, wave particle duality, De-Broglie's wave, uncertainty principle. Natural and artificial radio activity: α , β and γ emissions, chain decay. Elementary ideas of nuclear structure. Nuclear fission and fusion. Elementary particles and their classification.
7. **Electronics:** Elements of semi-conductor physics, Intrinsic and extrinsic semi-conductors, resistivity and its temperature variation, P-N junction and its application. P-N-P and N-P-N transistors and their applications. Logic gates.