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RECRUITMENT FOR THE POST OF JUNIOR TECHNICIAN (Physics)
<u>**SYLLABUS FOR TEST**</u>

Mechanics and Properties of Matter

Mechanics: Kinematics of Rigid Body Motion, Moment of inertia-parallel axis theorem and perpendicular axis theorem, Rotating frames of Reference, Inertial forces, Coriolis force. Gravitational field and Potential due to a solid sphere and spherical shell.
Motion in a Central force field , Central force - Conservation of angular momentum, reduction of two body central force motion into equivalent one body motion. General features of central force motion, differential equation of orbit, Kepler's Laws of Planetary motion, Virial Theorem.
Properties of Matter: Elastic constants of homogeneous isotropic solid and their inter relations. Torsion of a right circular cylinder, Bending of beams, bending moment, Cantilever, Beam supported at both ends and loaded at the middle.
Simple harmonic motion, damped harmonic motion, power loss, Q factor, under damped and over damped and critically damped motion, Forced vibration resonance, sharpness of resonance.
Kinematics of moving ideal fluid, Equation of continuity, Euler's Equation for ideal fluid, Bernoullie's Theorem, Viscous Fluids, Laminar flow through narrow tubes, Pouiseullie's
formula. Searle's Viscometer, Surface Tension and Surface Energy, Pressure difference across
a curved liquid surface, gravity waves and ripples.

Thermal Physics

Kinetic Theory of Gases and conduction: Ideal Gas, Review of the Kinetic model of an ideal Gas, Interpretation of Temperature, Equipartition of Energy; Real Gases, Vander Waal's Equation of State, Critical Constants, Reduced Equation of State, Mean Free Path, Clausius formula. Brownian Motion, Einstein's Formula, Joule-Thomson Expansion; Adiabatic Expansion of an ideal Gas., Thermal Conductivity, differential equation of heat flow in one-dimension and its solution, Relation between thermal conductivity and electrical conductivity. Wiedman and Franz Law.
Thermodynamics: Internal Energy, Carnot Cycle and its Efficiency, Carnot Theorem, the Laws of Thermodynamics, Entropy, Thermodynamic functions, Internal Energy, Enthalpy, Helmoholtz free Energy, Gibb's Function, Maxwell Thermodynamic equations and its applications. Clausius Clapeyron Equation and Joule –Thomson Effect, First order Phase transition. Black body radiation, Stefan's law and energy distribution in the black body spectrum, Wien's displacement law and Wien's formula and Rayleigh Jeans Formula and Planck's formula.

Atomic Physics

Discharge Phenomenon Through Gases and Atomic Structure: Moving of a charge in transverse electric and magnetic fields - specific charge of an electron - Dunnington's method - positive rays – Aston's , Dempster's mass spectrographs. Atomic spectra, Line spectra of hydrogen atom, Ritz Rydberg combination principle , Rutherford Model of atom and its limitations ,Bohr's model of Hydrogen atom. Bohr correspondence principle, limitations of Bohr model, Frank Hertz Expt. Inadequacy of classical physics.
Photo-electric Effect: Richardson and Compton experiment - Laws of photoelectric emission - Einstein photo electric equation - Millikan's experiment - verification of photoelectric equation - photo electriccells - photo emissive cells - photovoltaic cell - photo conducting cell - photomultiplier.
Ionisation Potential and Splitting of Energy Levels: Excitation and ionization potential – Frank and Hertz's experiment - Davis and Goucher's method. Spectral terms and notions - selection rules - intensity rule and interval rule -fine structure of sodium D lines - alkali spectra - fine structure of alkali spectra - spectrum ofHelium - Zeeman effect - Larmor's theorem - Debye's explanation of

normal Zeeman effect. Anomalous Zeeman effect. Lande's `g' factor and explanation of splitting of D1 and D2 lines of sodium. Paschen-Back effect - Stark effect (qualitative study only).

X-Rays: Bragg's law - X-ray spectroscopy - characteristic X-ray spectra - satellite and Auger effect - continuous X-ray spectra - X-ray absorption and fluorescence - Moseley's law - uses of X-rays - Compton effect - experimental verification of Compton effect.

Electricity and electromagnetism

Electrostatics : Product of vectors, Triple scalar product, Triple vector product, Differentiation of vectors, Gradient of a scalar, Divergence and curl of vector and their physical significance, The Laplacian, Line, surface and volume integral of vectors.

Statements of Gauss divergence theorem and Stoke's Theorem. Gauss's Law of electrostatics and applications, Electrostatic Potential, Electrostatic Potential energy, Dielectrics Polarization, Potential at a point due to a plane polarized dielectric, Gauss law in dielectric medium, Displacement vector, Gauss Law in its differential form, Linear dielectrics, susceptibility, permeability, dielectric constant.

Magnetism: Magnetic Induction, Lorentz force Law, force on a straight conductor in a uniform magnetic field, Torque on a current loop, Biot-Savart's Law, Magnetic induction due to a straight conductor, Magnetic induction on the axis of circular coil and solenoid carrying current, Ampere's Circuital law and its differential form. Magnetic induction on the axis of a solenoid carrying current. The laws of electromagnetic induction, its integral and differential form. Displacement current, Maxwell's electromagnetic equations-statements and their physical significance, Electromagnetic wave equation, properties of electromagnetic wave, Statement of Poynting Theorem.

Chemical Effects of Electric Current: Faraday's laws of Electrolysis - ionic velocities and mobilities. Calculation and experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient – experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses.

DC and AC Circuits: Growth and decay of current in a circuit containing resistance and inductance – growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation - network analysis - Thevenin and Norton's Theorems. AC Voltage and current - Power factor and current values in and AC circuit containing LCR circuit - series and Parallel resonant circuits - AC motors - single phase, three phase – star and delta connections - electric fuses - circuit brakers.