

Syllabus for Recruitment Examination of Post Graduate Teacher

SUBJECT: PHYSICS

Mechanics and properties of materials

Unit 1:- Physical world and measurement

System of Unit, measurement of length , mass and its dimensional analysis, error of measurement.

Unit 2:- Kinematics

Uniform motion, non-uniform motion, accelerated motion, vectors, motion in plan, circular motion and its example, projectile motion.

Unit 3:- Laws of motion

Newton's laws of motion, inertial and non inertial frames , elastic and inelastic collision, friction,

Unit 4:-Work, Energy & Power

Work done by a constant force and by a variable force, kinetic and potential energy, power, gravitational potential energy, spring constant, potential energy of a spring, different forms of energy, mass – energy equivalence.

Unit 5: -Motion of system of particles and rigid body

Centre of mass and its application, moment of force, torque angular momentum and its application. Moment of inertia, theorem of parallel axis and perpendicular axis. Moment of inertia of uniform rod, ring, disc, sphere and cylinder.

Unit 6:- Gravitation

Universal law of gravitation, variation of “g” due to altitude and depth and rotation of earth, gravitational potential, escape velocity , orbital velocity of satellite, geostationary satellite and polar satellite and their uses.

Unit 7:- Properties of matter

Elasticity, Hook's law, Elastic constant of isotopic solid and their relation, fluid pressure, Pascal's law, buoyancy , Archimedes principle, surface tension and its application, viscosity, Stoke's law, Poiseuille's equation, Bernoulli's theorem and its application.

Unit 8:- ‘D’ Alembert's principle motion under central force field, equation of orbit under centre force, Kepler's law. Generalised co-ordinates, Lagrange equation. Hamiltonian and Hamilton's Canonical equation and its application.

Heat and Thermodynamics

Unit 9:- kinetic theory of gases, deduction of pressure, Maxwell law of velocity distribution and its experimental verification, equi-partition law of energy, transport phenomena , conductivity and diffusion , Brownian motion, Avagadro's number, ideal gas equation, Vander waal's equation .

Unit 10 :-Thermal expansion in solid, specific heat of gases at constant volume and constant pressure, specific heat in solid (Dulong and petite's law).

Unit 11:- Thermodynamics

Zeroth laws and first law of thermodynamics , reversible and irreversible process, isothermal and adiabatic process. Carnot engine and refrigerator, Efficiency and co-efficiency performance of heat engine, second law of thermodynamic, Claussius-Clapeyron's equation. Kelvin thermodynamic scale of temperature and their application Gibbs's phase rule, triple point, Joule-Thomson effect.

Unit 12:- Transfer of heat

Conduction, convection and radiation, terminal conductivity of solid, black body radiation , Kirchhoff's law, Wien's displacement law, Stefan's law, Rayliegh-Jean formula, Planck's law, Newton's law, of cooling, solar constant, surface temperature of the sun.

Waves & Oscillation

Unit: - 13 Oscillation

Periodic motion and periodic function, simple harmonic motion and its equation energy of SHM. Simple pendulum damped simple harmonic motion and its equation. Logarithmic decrement, Relaxation time, Q factor, free and forced oscillation, resonance and sharpness.

Unit:- 14 Waves

Longitudinal and transverse wave transverse wave in string and its differential equation with solution, Velocity of sound in air. Newton's formula and Laplace's correction. Factors affecting the velocity of sound in air and gases. Displacement relation for progressive wave, principle of superposition of waves, standing wave in string and pipes, fundamental nods and harmonics , inference, beats and Doppler's effect of sound and light.

Unit:-15 Quantum Mechanics

Heisenberg's uncertainty principle, basic postulates of Quantum Mechanics, Schrodinger's time dependent and time independent equation, Eigen function, Eigen value. Application of Schrödinger's equation to particle in one dimension infinite potential well, potential step and Rectangular potential barrier. One dimensional infinite harmonic Oscillators, linear operator, Hermitian operator.

Unit:-16 Mathematical physics and Relativity

Divergences, gradient curl of a vector, Gauss divergence Theorem, Stoke's Theorem, Green's Theorem and its application, Series solution of linear differential equation (Legendre and Bessel equation). Fourier series and its application to square wave Sawtooth wave and triangular wave.

Formulation of special theory of relativity, Einstein basic postulates, Lorentz transformation-length contraction and time dilation, relativities, addition of velocities, variation of mass with velocity, mass-energy equivalences.

OPTICS

Unit:-17 Ray optics and optical instrument

Reflection of light by spherical mirror, refraction of light, total internal reflection and its application, refraction at spherical surfaces and by lenses, lens maker's formula. Magnification and power of lens, combination of thin lenses in Contact, refraction and dispersion of light through prism, Scattering of light

Compound microscope and astronomical telescope and their magnifying power

Unit 18 :- Wave Optics

Wave front, Huygens Principle, refraction and reflection of plane wave using Huygens Principle. Coherent and incoherent addition of waves, interference of light wave and young's experiment, Newton's ring, Michelson and Feby- Parrot interference, Fresnel and Fraunhofer diffraction, diffraction due to single slit and grating, Resolving power of microscope, telescope, grating, Polarisation of light, Brewster's law of polarization by scattering, analysis of elliptically and circularly polarized light, Polaroid's, specific rotation

ELECTROSTATICS

Unit 19:- Electric charge and fields .

Electric charge, basic properties of electric charge coulomb's law and superposition principle, electric fields and its physical significance, electric field due to point charge, electric field lines, Electric dipole. Electric field due to dipole and behaviour of dipole in a uniform external electric field. Electric flux, Gauss's theorem and its application

Unit20:- Electric potential and Capacitance

Electrostatics potential, Potential due to point charge, electric dipole and system of charge, Equipotential surfaces, electric potential energy of system of two charge Dielectric and polarization, capacitor and capacitance, parallel plate capacitor and effect of dielectric on capacitance, combination of capacitor, energy stored in a capacitor, Vande Graffs' generator.

Electricity and Magnetism

Unit 21:- Current Electricity

Electric current, Ohm's law and its limitation, Drift velocity and origin of resistivity, temperature dependence of resistivity, colour code of carbon resistors, combination of resistors- series and parallel, electrical energy and power, cell, emf and internal resistance of cells in bridge and parallel, Kirchhoff's law, Wheatstone bridge, meter bridge, potentiometer and its application, Thermoelectricity and its effect thermocouple, measurement of temperature.

Unit 22:- Moving charge and Magnetism

Magnetic force. Motion in combined electric and magnetic field, cyclotron, synchrotron, Hall effect, Bio-Savart law and its application, Ampere's circuit law and its application, Force between two parallel current, torque on current loop, magnetic dipole. Moving coil galvanometer. Conversion of galvanometer into Ammeter and Voltmeter

Magnetism and Gauss's law, Earth's magnetism, magnetization and magnetic intensity, Magnetic Properties of materials, permanent magnets and electromagnets.

Unit 23:- Electromagnetic induction and alternating current

Magnetic flux, Faraday's law of induction, Lenz's Law and conservation of energy, motion of electromotive force, Eddy currents, self and mutual inductance and their determination by using Ballistics galvanometer. Growth and decay of current in – L-R, C-R and LCR circuits, peak and rms value of a.c, reactance and impedance, LC oscillate, LCR Power of a.c circuit, wattless current, a.c generator, transformers.

Modern Physics :-

Photoelectric effect, experimental study of photoelectric effect, Einstein's photoelectric equation, photos cell, Compton effect, Raman effect, wave nature of matter, De- Broglie relation, Davisson and Germer Experiment

Alpha – particle scattering and Rutherford model of atom, Bohr's Theory of hydrogen atom, the lines spectra of the hydrogen atom, Sommer field's elliptical orbit and relativistic correction, vector model of atom, Quantum numbers, Pauli's

exclusion principle, Zeeman effect, production of X-rays and its Characteristic, diffraction of – x-rays, Bragg's law, measurement of wavelength.

Atomic masses and composition of nucleus, size of nucleus mass defect, binding energy per nucleons and its variation with mass number, magic number, nuclear force, liquid drop model.

Radioactivity, decay law, half and mean life, properties of alpha beta and gamma ray, Nuclear fission and nuclear fusion, Q- value of a reaction, Thresholds energy, Quark model of elementary particle.

Electronics and communication

Unit 24:- Electronic

Intrinsic and extrinsic semiconductor, p-type and n-type , P-N junction diode as rectifier, half wave, full wave and bridge rectifier, different types of diode, photodiode, zener diode, LED, Solar cell, zener diode as voltage regulator.

Transistor, action of transistor, characteristics of transistor, transistor as amplifier-CB, CE and CC configuration with h- parameters, voltage gain, current gain, power gain, Feedback Amplifier and advantage of negative feedback amplifier , R-C couple, amplifier and push amplifier (Class A and Classes B) Transistor as Switch, Transistor as Oscillator, Barkhausen criterion, Hartley and Colpitt's Oscillator, R-C Shift and Wein Bridge Oscillator, Multi- vibrator monostable and bistable.

Logic gates OR, AND, NOT, NAND, XOR Gates, Integrated circuit, wafer chips.MSI, LSI, VLSI and Norton's theorem.

Unit 25:- Communication

Elementary idea of analog and digital communication need for modulation, amplitude modulation, phase modulation, frequency modulation and pulse modulation. Data transmission, Fax and modem, Production and detection and amplitude modulated wave, demodulation.

Propagation of electromagnetic wave in atmosphere, SKY wave, ground wave and space wave propagation, satellite communication. Line communication – two line, wire line, cables, telephone links optical fibre, lasers.

Dynamic :- Moments and production of inertia, parallel axes theorem- D Alembert's Principle. The general equation of motion of a rigid body, motion of the centre of inertia and motion relative to the centre of inertia. Motion about a fixed axis. Compound pendulum.

Unit 26:- Linear Programming

Linear programming problem, Basic solution, basic feasible solution and optional and optimal solution, graphical method of solution, Problem related to duality, manufacturing. Allocation and transportation problem

Unit 27:- Introduction to computer programming

What is computer? Mechanical Computer, different generation of computer. Micro-Computer, Super Computer, Macrocomputers, Microprocessors, Memory System (Internal and External).Software system, application software, categories of language, Machine language, Assembly Language. High level and fourth generation language.