Syllabus for Admission Test to the B.Sc. Physics Major programme at Presidency University

1. Dimensions of physical quantities, Dimensional analysis and its applications, Frames of reference, Scalars and vectors, Position and displacement vector, Vector Algebra, Speed and velocity, Uniformly accelerated motion in a straight line, Elementary concepts of differentiation and integration for describing motion, Projectile motion, Uniform Circular motion, Newton's laws of motion, Impulse, Static equilibrium under forces, Conservation of linear momentum, Static and kinetic friction, Concept of work, kinetic and potential energies, Conservation of mechanical energy, Elastic and inelastic collision in one and two dimension, Centre of mass of a two-particle system and a rigid body, Torque, Angular momentum and its conservation, Rotational motion of rigid bodies, Moment of inertia and radius of gyration for simple geometrical objects (no derivation), Parallel and perpendicular axes theorems (statement only),

2. The Universal law of gravitation, Acceleration due to gravity and its variation with altitude, depth, Gravitational potential energy, Escape velocity, Kepler's laws of planetary motion, Satellite motion, Elastic properties of matter, surface tension and viscosity, Hydrostatics.

3. Periodic motion, Spring-mass system and simple pendulum as example of Simple Harmonic Motion (SHM), Conservation of mechanical energy in SHM, Qualitative ideas of forced and damped vibration, resonance, Longitudinal and transverse waves, Velocity of wave propagation, Progressive waves, Stationary waves, Strings, Open and closed pipes, Beats, Doppler effect.

4. Assumptions of kinetic theory of gases, Concept of pressure, Kinetic energy and temperature, Mean free path, Degrees of freedom, Statement of equipartition of energy, Application to specific heat of gases, Thermal expansion of solid, liquid and gases, Calorimetry and change of state, Transmission of heat, Zeroth law of thermodynamics, Work and internal energy, First law of thermodynamics, Reversible and irreversible processes, Second law of thermodynamics, Heat engines and refrigerators.

5. Electric field and potential, Coulomb's Law, Gauss's Theorem and its applications to simple symmetrical charge distributions, Conductors and insulators, Dielectrics and electric polarisation, Capacitance of a parallel plate capacitor, Combination of capacitors in series and parallel, Flow of electric charge in a metallic conductor, electrical resistance, Ohm's Law, series and parallel combination of resistors, Emf of a cell, combination of cells in series and parallel, Kirchoff's laws and simple applications, Wheatstone bridge, Heating effect of current.

6. Magnetic field, Oersted's experiment, Biot-Savart law, Ampere's law, Force on a moving charge in a uniform electric and magnetic field, Cyclotron, Force on a current carrying wire in a uniform magnetic field, Force between two parallel current carrying wires, Torque on a current loop in a uniform magnetic field, Moving coil galvanometer, Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, Terrestrial magnetism, Electromagnetic induction, Faraday's Law, Lenz's Law, Eddy currents, Self and mutual inductance, Alternating currents.

7. Reflection of light, Refraction of light, Lenses, Magnification power of a lens, Refraction and dispersion of light through a prism, Optical instrument, Microscopes and astronomical telescopes and their magnifying powers, Wave optics, coherent sources and interference of light, Young's double slit experiment.

8. Dual nature of radiation, Photoelectric effect, Matter waves, de Broglie relation, Davisson-Germer experiment, Alpha particle scattering experiment, Rutherford's model of an atom, Bohr model, hydrogen spectrum, Continuous and characteristic X rays, Composition and size of nucleus, atomic masses, isotopes, isobars, Radioactivity, Radioactive decay law, alpha, beta, and gamma particles/rays and their properties, Energy bands in solids, Conductors, insulators and semi-conductors, Semiconductor diode and junction transistor, Semiconductor logic gates AND, OR and NOT, Use of HW, FW rectifiers.

A small number of mathematical problems and conceptual (intuitive) problems in physics will also be asked.