

Test Code : PHB : (Short Answer Type) 2017

Junior Research Fellowship in Physics

The candidates for Junior Research Fellowship in Physics will have to write two papers – Test MMA (objective type) in the forenoon session and Test PHB (short answer type) in the afternoon session.

The PHB test booklet will consist of two parts. The candidates are required to answer both Part I and Part II.

The syllabus for the test is as follows.

PART-I

Mathematical and logical reasoning

Syllabus

B.Sc. Pass Mathematics syllabus of Indian Universities.

PART-II

Physics

Syllabus

1. Classical Mechanics

Mechanics of a particle and system of particles, Scattering in a central field, Lagrange's equation and their applications, Hamilton's equation, Canonical transformations, Special theory of relativity, Small oscillations, Vibrations and acoustics.

2. Electromagnetic theory

Electrostatics, Magnetostatics, Maxwell's equations, Gauge transformations, Poynting's theorem, Wave equation and plane waves, Radiating system and scattering.

3. Statistical Physics and Condensed Matter Physics

Statistical basis of thermodynamics, Ensembles – microcanonical, canonical and grand canonical, Quantum statistics, Phase transitions, Statistical fluctuations, Free electron theory, Band theory of electrons, Semiconductor physics, Transport phenomena, Magnetism, Superconductivity.

4. Quantum Mechanics and Quantum Field Theory

Schrödinger wave equation, General formalism of wave mechanics, Exactly solvable eigenvalue problems for various potentials, Approximation methods,

Scattering theory, Time dependent perturbation theory, Symmetries and conservation laws, Relativistic quantum mechanics, Quantum field theory – scalar and spinor fields, Quantum electrodynamics.

5. **Elementary Particles**

Elementary particles, Weak and strong interactions, Selection rules, CPT theorem, Symmetry principles in particle physics.