

SYLLABUS FOR WRITTEN TEST FOR M.Phil./Ph.D. ADMISSIONS 2020
DEPARTMENT OF BIOPHYSICS
UNIVERSITY OF DELHI SOUTH CAMPUS

The questions would be based on the following topics as taught at a Master's level course.

Life Sciences

- **Cellular organization and function**
- **Cell cycle and division**
- **Structure and organization of chromosomes, genes and genomes**
- **DNA, RNA and Protein synthesis:** Replication, transcription and translation
- Regulation of gene expression in prokaryotes and eukaryotes
- Molecular cell signaling
- **Methods in cell and molecular biology:** Basics of cell biology; microscopy; separation techniques; radiolabeling techniques; recombinant DNA technology
- **Basic statistical methods:** Measures of central tendency and dispersal, Chi square, Student's T-test, F test
- **Biophysical Method:** Molecular analysis using light scattering, UV/visible, fluorescence, circular dichroism, NMR.
- **Histochemical and Immunotechniques:** ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy.
- **Biomolecular Sequencing:** Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing.
- **Bioinformatics:** Protein and nucleic acid sequence and structure analysis.

Mathematics

Linear Algebra; Simultaneous Equations; Rational & Irrational Numbers; Imaginary Numbers; Indices; Arithmetic & Geometric Progression; Straight lines; Matrices; Determinants; Trigonometric quantities, theorems, equations; Pythagoras Theorem; Geometry of Triangles, Quadrilaterals, Circles, Cylinders, Cones, Pyramid; Tangent & Normal; Equation of Straight lines, Parabola; Circles, Ellipse; Functions; Limits; Continuity; Differentiation; Maxima, Minima; Integration; Areas; Linear Differential Equations; Non-linearity.

Physics

Force, Motion, Acceleration, Momentum; Newton's Laws of Motion; Gravitation & Projectiles; Circular Motion, Centripetal & Centrifugal Forces; Buoyancy & Archimedes' principle; Ideal Gas Laws; Stress & Strain and related laws; Simple Harmonic motion; damped Oscillations; Propagation of Waves; Velocity & Frequency of Sound; Laws of Thermodynamics; Work, Internal Energy, Enthalpy, Entropy; Kinetic Theory of Gases; Temperature; Electrical potential, current, Resistance, conductance; Flow of electricity in solids; Diodes, Triodes & Semi-conductors; Laws of Electromagnetism; Laws of Reflection, Refraction, Dispersion, Diffraction of Light, Refractive Index; Total Internal Reflection; Max Planck's theory of Quanta; wave-particle duality; Heisenberg's uncertainty principle; Wave functions; Schrodinger's Equation and applications; Nuclear Fusion & Fission; Atomic Radiation.

Chemistry

Periodic Table; Electronic Structure of Atoms; Valence; Molecular Orbital; Inter-atomic & Intermolecular forces; Principles of Chemical Bonding; Electrostatic Covalent, Double, Triple & Coordinate Bonds; Chelation; Hydrogen Bond; Chemical equilibrium; Chemical Kinetics; Free Energy of Reactions & Chemical Potential; vant Hoff equation; Ionic dissociation; Electrolytic cells; Nerst Equation; Acids & Bases; pH, pK, Buffer.

Research Methodology

Ethics in Research, Plagiarism, Intellectual Property Right, Statistical Analysis of Data, Research writing, Publishing Research, Good lab practices