



**Syllabus: Research Methodology  
PhD Entrance Examination  
TERI School of Advanced Studies**

**1. Protein Biochemistry and Structural Biology:**

Biological macromolecules (Proteins, Carbohydrates, Lipids, Hormones and Vitamins), Acids and Bases, Classification of proteins, Enzymes and kinetic parameters, Immunoglobulins, X-ray crystallography, Electron Microscopy and NMR techniques, Metabolic pathways and Bioenergetics (Gibb's free energy, Enthalpy and Entropy, First and second laws of thermodynamics and limitations).

**2. Plant Science:**

Plant Physiology, Cell Biology, Molecular Biology & Biochemistry.

**3. Bioinformatics:**

Introduction to Bioinformatics and its Application, Molecular Biology for bioinformatics, Biological data bases and its Annotation, sequencing techniques, Pairwise and multiple sequence alignment algorithm, Phylogenetic Analysis, homology modelling, molecular modelling.

**4. Microbiology & molecular biology:**

General microbiology, germ theory of disease, pathogens and disease, laws of genetics, Hardy-Weinberg equilibrium, central dogma, sequence hypothesis, nucleic acid structure and function.

## **5. Ecology and evolution:**

Concepts of evolutionary biology (organisms and molecules), spontaneous generation, convergent and divergent evolution, principles of ecology, ecological niches and community ecology, symbiosis.

## **6. Nano sciences:**

Atomic structure, chemical bonding, gaseous state, solid state chemistry, solutions, nanomaterials, stereochemistry, analytical techniques.