

Scientist B – Biotechnology / Molecular Biology

Name of the post	Subject	Syllabus
Scientist B - Biotechnology/ Molecular Biology	Biotechnology	Biochemistry: Biomolecules (carbs, lipids, proteins, nucleic acids), Metabolism, Enzymes, Photosynthesis, Respiration. Cell Biology: Cell structure, dynamics, signaling, membrane transport. Microbiology: Microbial diversity, culture, growth, antibiotics, human-microbe interactions. Genetics: Mendelian genetics, DNA replication, gene expression, mutations, linkage, mapping. Biophysics & Instrumentation: Principles, basic math, data analysis, use of equipment (spectroscopy, electrophoresis).
	Molecular Biology	Foundations & Biomolecules: Introduction to cells, biomolecules (DNA, RNA, Proteins, Amino Acids), cellular structures, and basic biochemistry. Central Dogma: DNA structure, replication (prokaryotic/eukaryotic), transcription (RNA synthesis), and translation (protein synthesis). Gene Regulation: Operons, prokaryotic/eukaryotic control mechanisms, chromatin structure, and post-transcriptional/translational modifications. Molecular Techniques: PCR, DNA Sequencing, Southern/Northern/Western Blotting, Electrophoresis, Chromatography, Spectroscopy, Calorimetry. Recombinant DNA & Genetic Engineering: Vectors, gene cloning, genetic modification, and creating transgenics. Advanced/Applied Areas: Genomics, Proteomics, Bioinformatics (BLAST, alignments, modeling), Molecular Evolution, Nanobiotechnology, and Bioethics.
	Biochemistry	Biomolecules: Structure, properties, and functions of Amino Acids & Proteins, Carbohydrates, Lipids, Nucleic Acids (DNA/RNA). Enzymes: Kinetics, mechanisms, regulation, and classification (biocatalysts). Metabolism: Major pathways like

		Glycolysis, Citric Acid Cycle, Oxidative Phosphorylation, Fatty Acid Metabolism, Amino Acid Metabolism, Nucleotide Metabolism. Bioenergetics: Energy production (ATP), thermodynamics in biological systems. Molecular Biology: DNA Replication, Transcription, Translation, Gene Regulation (e.g., Lac Operon), PCR. Cell Biology: Cell organelles, membranes, transport, cell signaling. Genetics: Basic principles, genetic material, mutations.
	Botany	Plant Diversity & Evolution: Viruses, Bacteria, Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms. Plant Structure & Function: Morphology, Anatomy (of angiosperms), Embryology, Plant Physiology, Biochemistry. Genetics & Molecular Biology: Cell Biology, Genetics, Genomics, Recombinant DNA Technology, Plant Biotechnology. Ecology & Environment: Plant Ecology, Phytogeography, Environmental Botany, Plant Pathology. Applied Botany: Economic Botany, Plant Breeding, Phytopathology, Biotechnology Applications.
	Agriculture	General Agriculture-All basic courses (Agronomy, Genetics & Plant Breeding, Soil Science & Agricultural Chemistry, Plant Physiology, Plant Pathology, Agricultural Economics & Agricultural Marketing, Statistics, Plant Biotechnology, Plant Biochemistry)
	Plant Biotechnology	Fundamentals: Biochemistry, Microbiology, Cell Biology, Genetics, Plant Developmental Biology. Plant Tissue Culture (PTC): Basics: Media preparation, sterilization, callus, organogenesis, embryogenesis. Applications: Micropropagation, synthetic seeds, cryopreservation, secondary metabolite production. Advanced: Protoplast isolation, fusion, somatic hybridization, cybrids, somaclonal variation. Genetic Engineering & Molecular Biotech: Recombinant

		<p>DNA Technology, gene cloning, vectors. Transgenic plant development (methods, applications in crop improvement). CRISPR/Gene Editing.</p> <p>Molecular markers, DNA fingerprinting. Advanced Topics: Bioinformatics: Databases, sequence analysis, tools. Stress Biology: Plant responses to biotic/abiotic stresses, innate immunity. Phytochemistry & Metabolism: Biosynthesis of secondary metabolites (terpenes, phenolics, etc.). Plant Growth Promoting Bacteria (PGPR). Biosafety & Ethics: GMO regulations, risk assessment, IPR, socio-economic impacts.</p>
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