Syllabus for Botany Master's

Section 1: Subject Knowledge

Please Note: A Total of 40 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: Cell and Molecular Biology

Cell membrane structure and transport mechanisms, cytoskeleton and cell motility, and cell signaling pathways, Cell cycle and division, organelle functions, gene expression regulation, and apoptosis, Cellular stress responses and modern research techniques (microscopy, flow cytometry, cell culture).

Unit II: Genetics and Cytogenetics

Mendelian genetics, complex inheritance, gene interactions, and quantitative traits, Gene structure and function, DNA replication, transcription, translation, and regulation, Epigenetics, population genetics, genomics, and CRISPR genetic engineering.

Unit III: Physiology and Biochemistry

Water in plant metabolism, absorption, and transpiration, Mineral nutrition and nutrient uptake, Photosynthesis (C3, C4, CAM), respiration, and growth regulators, Crop productivity and growth analysis, Secondary metabolites and their roles in plant defense.

Unit IV: Recombination DNA Technology

Media preparation, E, coli culturing, gene cloning, and functional analysis, PCR optimization, primer design, DNA ligation, and recombinant selection, Exercises include DNA amplification, purification, restriction digestion, gel extraction, and E, coli transformation.

Unit V: Developmental Biology

Fertilization, cleavage, and early embryonic development (blastulation, gastrulation), Axis formation, morphogenesis, and organogenesis, Role of stem cells in development, regeneration, and differentiation,

Unit VI: Systematics, Evolution, and Environmental Science

Plant signaling and communication through VOCs, hormones, and visual cues, Role of signals in plant interactions, pollinator attraction, symbiotic, and pathogenic relationships, Hormonal signaling pathways (auxins, gibberellins) in plant responses.

Unit VII: Plant Biotechnology and Resource Utilization

Callus culture, organogenesis, somatic embryogenesis, and micropropagation for plant regeneration, Gene transfer methods (Agrobacterium-mediated, direct DNA transfer, CRISPR), Molecular markers (RFLP, AFLP, SSR, SNP) in plant breeding and trait selection.

Unit VII: Pathogens and Pests of Crop Plants

Study of plant diseases, pathogens (fungi, bacteria, viruses, nematodes), and insect pests, Epidemiology, pathogen detection methods, and Integrated Pest and Disease Management (IPDM) for sustainable crop protection.

Unit VII: Genomics and Proteomics

Genomic technologies, genome structure, and NGS applications, Genomic data analysis, functional and comparative genomics, and population genomics, Ethical considerations in genomics, Introduction to proteomics, protein structure, and mass spectrometry techniques.

Unit VII: Reproductive biology of flowering plants

Sexual and asexual reproduction in flowering plants, Flower structure, pollination strategies, fertilization, and self-incompatibility mechanisms, Embryo and seed development, formation, and dormancy.

Unit VIII: Agricultural Ecology

Principles of plant ecology, abiotic and biotic factors, and plant population dynamics, Community and ecosystem ecology, plant adaptations, and global biomes, Phytogeography, endemism, biodiversity hotspots, and conservation, Impact of climate change, ecological succession, and invasive species on plant communities.

Section 2: Fundamental Skills

Please Note: A Total of 24 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: Data Analysis Unit II: Math and Statistics Unit III: Lab skills Unit IV: Reading and Writing

Section 3: Specific Skill Proficiency

This section has more than 30 skills. You can select the ones you are proficient in from the enrollment form. You can choose a maximum of 4 skills. Each skill contains 10 questions.

