



# DAV UNIVERSITY, JALANDHAR

PhD Entrance Test Syllabus

## DEPARTMENT OF BOTANY

### Section A (50 questions)

#### Research Methodology

**Descriptive statistics:** Definition and relevance in biological research; Measures of Central Tendency: Arithmetic Mean, median, mode, quartiles and percentiles; Measures of Dispersion: Range, variance, standard deviation, coefficient of variation; Skewness and Kurtosis. Probability Theory.

**Inferential statistics:** Hypothesis testing, Errors in Hypothesis Testing- Null Hypothesis, Alternative Hypothesis, Type I and Type II errors, Confidence Limits. Setting up of level of significance. One tailed and Two- tailed tests.

**Correlation and Regression:** Correlation coefficient (r), properties, interpretation of r, partial and multiple correlations, linear regression: Fitting of lines of regression, regression coefficient, Bivariate and Multiple Regression.

**Parametric and Non-Parametric Statistics:** Definition, Advantages, Disadvantages, Assumptions; Parametric Tests: Student's t-test, One Way Analysis of Variance, Two Way Analysis of Variance; Non-Parametric Tests: Analysis of Variance, Chi square and Kendall Rank Correlation. Basic principles and significance of research design; Randomized Block Designs (RBD), completely randomized designs (CRD); Latin square design; Split plot design and Factorial design. Data collection, organization and interpretation. Research articles, research papers, popular research articles and reviews; difference between periodicals; journals; monographs, magazines; proceedings. Science citation index; H-index, i10 index, Impact factor calculation, Impact factor of a journal; Eigen factor, Major journal search engines. Copyright act; Academic frauds; Plagiarism; Software's to check plagiarism.

### Section B (50 questions)

#### Botany

**UNIT-I:** Algae:classification, Salient features of major divisions; Ecological and economic importance of Algae. Fungi:Classification of fungi; general characters, Fungal associations and their significance; Agricultural significance of Fungi. Bryophyta:Classification and general characters; economic importance Pteridophyta: Classification and general characters of Pteridophytes Gymnosperms: General characteristic features of Gymnosperms and their affinities with pteridophytes and angiosperms; classification of Gymnosperms; Distribution of Gymnosperms in India.

**UNIT II:** Introduction to the Angiosperms: Taxonomic History; classification; Keys for identification of plants; Basal angiosperms and Magnoliids; Basal monocots; Petaloid monocots; Commelinids; Basal eudicots and Caryophyllids; Rosids; Asterids. Botanical Nomenclature: Kinds of names; ICBN, Names according to rank; Citation of authors; Priority; Type method; Naming a new species; Legitimacy; Synonyms. Phylogenetics: The nature of phylogeny; How we depict phylogeny? The importance of homology, Polarizing characters of homology; The problem of homoplasy.

Salient Features and Economic Importance of Monocot/Dicot Families: Apocyanaceae; Verbenaceae; Chenopodiaceae; Capparidaceae; Caryophyllaceae; Myrtaceae; Apiaceae; Acanthaceae; Moraceae; Rubiaceae; Amaranthaceae; Musaceae; Cannaceae; Commelinaceae.



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Origin and economic significance of the following: Medicinal and aromatic plants; Fiber yielding plants, Spices and condiments; cereals, pulses, Rubber yielding plant; tea, coffee, Oil yielding plants; source and uses of plant based insecticides

**UNIT-III:** Plant Cell and Tissue Culture: Principles, Cellular totipotency; Somatic embryogenesis and synthetic seeds, Somatic hybridization; Application in biotechnology. Plant Breeding: Objectives, domestication and centres of origin of cultivated plants. Hybridization: Role and methods, Back-cross breeding. Pedigree method; Bulk method; Single-seed descent method; Heterosis, Inbreeding depression. Breeding for resistance: Breeding for biotic and abiotic stresses, physical and chemical mutagens; Gamma gardens; Heritability and its Methods of estimation; Reciprocal recurrent selection; Reciprocal recurrent selection based on test cross of half-sib families; Reciprocal recurrent selection based on half-sib progenies of prolific plants; Reciprocal full-sib recurrent selection.

Phytopathology: process of infection and pathogenesis, Defense mechanism in plants, Diseases in plants: Symptoms, etiology and disease cycle. Wheat- rust, smut; Rice-sheath blight; Cucurbits-Powdery mildew; Sugarcane-red rot; Potato-late and early blight; Crucifers-white rust; dieback disease of grasses. Chemical and biological means of disease control.

**UNIT-IV:** Genome: Genome organization in prokaryotes and eukaryotes, Nuclear DNA content; law of DNA constancy and C-value paradox; Cot curves, chromosomes, linkage and genetic mapping, gene mapping methods, transposons Prokaryotic & eukaryotic DNA replication, Prokaryotic and eukaryotic transcription, Protein synthesis and processing, Control of gene expression at transcription and translation level, Transgenic Plants, recombinant DNA technology, Gene Transfer Methods in Plants (direct gene transfer methods; restriction endonucleases, ligases, applications of genetic engineering; floral-dip

**UNIT-V** Biomolecules: biomolecules (composition, structure and function), stabilizing interactions, conformation of proteins; conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA); stability of proteins and nucleic acids. Physiology: Water and Plant Cells; Mineral Nutrition, photosynthesis in higher plants; plant respiration, Phytochromes and cryptochromes; Photoperiodism., Plant Hormones, principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes; Stress physiology, Nitrogen metabolism, Physiology of flowering, seed germination, senescence

**UNIT-VI:** Ecology and Environment: Definition, history and scope of ecology, sub divisions of ecology, ecology vs environmental science. Interdisciplinary nature of environmental science. Evolution and Natural Selection, Ecological succession, Ecosystem organization: Structure and functions; primary production; energy dynamics; global biogeochemical cycling and ecosystem nutrient cycles, primary and secondary productivity, food chains, food webs, ecological pyramids, energy flow and nutrient cycles.

Environment Protection: Conservation of Soil, Agriculture, Biodiversity, aquatic systems; Bioremediation, Phytoremediation, Endangered and threatened species. International concern and efforts for environmental protection, Earth Summits. Global warming; Climate change. Phytogeography: Climate, vegetation and botanical zones of India, Application of remote sensing in vegetation classification,

**UNIT-VII** Techniques: Microscopy, Chromatographic techniques, Centrifugation, Electrophoresis and Isoelectric focusing, Molecular techniques: Random Fragment Length Polymorphism (RFLP); Fluorescence In-Situ Hybridization (FISH), Genomic In-Situ Hybridization (GISH), Fiber-FISH, Q-FISH; Flow FISH: Flow Cytogenetics, Flow karyotyping; Random amplified polymorphic DNA. Proteomics, Separation and identification of cellular proteins, Genomics, genome sequencing strategies.