

19 - Botany

**Syllabus for Ph.D. / M.Phil. Entrance Examination
2016-17**

UNIT-I

Algae, Fungi, Bacteria and Viruses

Algal pigmentation, life cycle and reproduction in Chlorophyta, Phaeophyta and Rhodophyta. Economic importance of Algae.

General characters and classification of Fungi. Structure and life cycle of *Alternaria*, *Cercospora*, *Ustilago* and *Colletotricum*. Heterothalism and Parasexuality. Role of fungi in Agriculture and Medicine. Genetic recombination in Bacteria (Transformation, Transduction and Conjugation). DNA and RNA viruses. TMV, YBBV, Virioids and Prions.

UNIT-II

Bryophytes, Pteridophytes and Gymnosperms

Classification of Bryophytes, Pteridophytes and Gymnosperms. Economic importance of Bryophytes, Pteridophytes and Gymnosperms. Life cycle of *Selaginella* and *Isoetes*.

Heterospory and Seed habit.

Life cycle of *Gnetum* and *Ephedra*.

Geological time scale

UNIT-III

Plant Systematics and Phytogeography

Work of Cronquist, Takhtajan, Linneus and Bentham and Hooker. Herbarium and Plant nomenclature, ICBN, Brief account of Botanical garden in India and World and their importance. General characteristic and Economic importance of some important plants belonging to Monocots and Dicots. Hotspots, Endemic plants.

Continental drift, Plant distribution and Migration. Phytogeographical regions of world and India

UNIT - IV

Ecology and Environment

Ecosystem: Concept and components, trophic structure, diversity and characters of major ecosystems- Aquatic and terrestrial; Energy Flow in ecosystems.

Biogeochemical cycles: Water, Carbon, Nitrogen, Sulphur and Phosphorus.

Plant succession.

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Soil: Formation, profile and properties. Soil erosion and conservation.

Plant interaction: Competition, Allelopathy.

Physical environment; biotic and abiotic interactions. Structure and composition of atmosphere.

Pollution: Air, Water and Land (Sources of pollutants and their effects on plants).

Green house effect and ozone depletion, climate change and its effect on its vegetation and crop productivity.

Remote sensing and geographical information system, biodegradation of pollutants. Environmental education and awareness. Environmental protection acts.

UNIT- V

Plant Anatomy and Embryology

Ultra Structure and Chemistry of Cell Wall.

Wood Anatomy, Anomalous secondary growth

Microsporogenesis, Megasporogenesis,

Fertilization, post fertilization changes, Self incompatibility, Apomixis, Somatic embryogenesis.

Types of Endosperm, ovule and embryo cultures.

UNIT-VI

Cell Biology and Genetics

Mendelian and Post Mendelian genetics. Complementary, epistasis, inhibitory, lethal and additive interaction of genes.

Sex determination, Dosage compensation, sex-linked inheritance, sex determination in plants.

Cytoplasmic inheritance. Factors affecting allelic frequencies in population, mutation, Migration,

Random Genetic Drift, Human Genome Project.

Cell: Cell wall, membranes, internal organization of nucleus, structure and functions of Cell inclusions. Cytoskeletons and Cell movements.

Structure and functions of lysosome, ER, ribosome, plastids, Golgi bodies.

Biogenesis

Cell cycle- Regulation of CDK-cyclin activities,

DNA replication in prokaryotes and eukaryotes, DNA damage and repair.

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Ch. Renu *in health class*

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Organization of chromatin – euchromatin and heterochromatin, rearrangement, repetitive and non-repetitive DNA, C-value paradox, transposable elements, applications of transposons in research and health care system. Nucleosome model, structure and organization of telomere, centromere and kinetochore. Basis of crossing over, Chromosome mapping.

UNIT: VII

Plant Physiology

Structure of amino acids and proteins. Enzymes- Nomenclature and properties. Extraction and purification; Properties and classification of Carbohydrates and Lipids, Membrane Structure and organization, Passive and active transport process.

Photosynthesis: Electron and Proton transport; photophosphorylation C4 and crassulan pathway, Photorespiration.

Respiration: Electron and proton transport mechanism and cycles of respiration, ATP synthesis.

Plant growth hormones; Nitrogen metabolism and fixation; Characteristics of biological rhythms, phytochrome and stress physiology- Biotic and Abiotic stress.

UNIT: VIII

Plant Pathology and Protection

Disease classification, Causal factors - biotic and abiotic, disease diagnosis, Koch's postulates.

Defense Mechanism in plants: Structural and Biochemical.

Genetics of Host – Pathogen interaction: Gene to gene and polygene hypotheses.

Immune and hypersensitive reactions.

Epidemiology: Traditional and modern concepts of disease triangle,

Methods of assessment of disease incidence and disease severity and estimation of yield loss.

Brief account on plant diseases (Wilt, Rots, leaf spots, Smuts and Rusts)

Principles and concepts of plant disease control: Regulatory, physical, cultural, chemical and biological methods.

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UNIT: IX

Plant Breeding and Plant Biotechnology

Objectives and techniques of Plant breeding; Breeding methods;

Selection and hybridization; Role of heterosis and hybrid vigor in plant breeding; Male and Self incompatibility; Somaclonal variation in crop improvement. Molecular plant breeding (RFLP, AFLP, SNP and SSR).

Propagation of crop plants; Plant tissue culture, Protoplast Culture; somatic embryogenesis; secondary metabolites; Bioreactors; Germplasm conservation; cryopreservation.

UNIT: X

Molecular Biology and Genetic Engineering

Central dogma of molecular biology, Gene concept, structure of gene. Concept of split gene. Split genes in Mitochondria and Chloroplasts. Overlapping gene, Pseudo gene and cryptic gene.

Properties of genetic code. Regulation of gene expression in Prokaryotes and Eukaryotes. Operon concept. Transcription, DNA methylation, RNA processing. Translation, Gene Immunity. Natural and acquired immunity, Immune responses-humoral and cell mediated immunity

R-DNA Technology: Restriction enzymes (RE), Nomenclature and Mode of Action of REs. DNA ligase, Kinase, Klenow fragment, Reverse transcriptase, Alkaline Phosphatases, Terminal Deoxynucleotide transferase, T4 Ligase.

Cloning Vectors: Plasmids, Cosmids, Shuttle Vectors, Yeast episomal plasmid and Yeast replicating plasmid. Southern, Northern and western blotting techniques. DOT blotting techniques,

DNA Libraries, c-DNA Library.

Principle involved in PCR, components of PCR, different types of PCR (Inverse PCR, Anchored PCR, RT-PCR) Applications of PCR.

Gene Transfer Methods: 1. *Agrobacterium* mediated genetic transformation, 2. Transfer of genes using physical delivery methods; Poly ethylene glycol mediated DNA up take, Liposome mediated DNA uptake, Micro injection and Micro projectile bombardment method. Trans genes and Transgenic plants: Marker genes; Reporter genes, (cat, gus, Luc, GFP) BT toxin gene, Proteinase inhibitor, Cowpea trypsin inhibitor.

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