

**UNIVERSITY OF JAMMU**  
**DEPARTMENT OF BOTANY**  
**SYLLABUS FOR ENTRANCE TEST FOR Ph.D. IN BOTANY**  
**[2023-2024]**

**UNIT-1**

**1.1 Cell Biology**

Plasma membrane – structure & functions  
Chloroplasts & Mitochondria – structure, function and organization  
Endoplasmic reticulum and Golgi apparatus-structure & function.

**1.2 Molecular Biology**

DNA and RNA – structure, types and functions, Replication, Transcription, Splicing and Translation. Protein trafficking – cotranslational and post-translational  
Cell cycle and apoptosis – role of cyclins and CDKs, control mechanisms.

**1.3 Cytology, Genetics and Cytogenetics**

Molecular organization of centromere and telomere.  
Recombination – site specific and generalized, molecular mechanism, Holliday model  
Somatic cell genetics.  
DNA damage and repair; Transposons in pro – and eukaryotes.  
Transfer of whole genome, individual chromosomes and chromosome segments.

**UNIT-2**

**2.1 Microbiology**

General characteristics, ultrastructure, reproduction and economic importance of Eubacteria, Archaeobacteria, Phytoplasmata, Plant viruses and Fungi.

**2.2 Biology of Lower Plants**

Life cycle patterns among algae, bryophytes and pteridophytes, alternation of generations and its significance; diversity in plant organization, sporophytic diversity among bryophytes and pteridophytes; economic importance of algae, bryophytes and pteridophytes.

**2.3 Gymnosperms**

General characters of gymnosperms; their distribution in India; structure and reproduction in Cycadales, Ginkgoales, Ephedrales, Welwitschiales and Gnetales; concept of progymnosperms; economic importance of gymnosperms.

**UNIT-3**

**3.1 Taxonomy of Angiosperms**

Concept of artificial, natural and phylogenetic system of classifications.  
Taxonomic hierarchies. Taxonomic tools. Basic knowledge of ICBN. Endemism viz a viz hotspots with respect to Indian flora.

**3.2 Plant Development**

Seed – dormancy and seed germination; seedling development; organization of RAM and SAM: secretory ducts and laticifers.

**3.3 Plant Reproduction**

Flower development – MADS box concept, Male sterility-phenomenon and implications, Self- incompatibility: types and genetics. Embryo and endosperm development. Apomixis; Fruit development and ripening. Seed structure and function.

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**UNIT-4**

**4.1 Plant Physiology and Metabolism**

Concept of water potential, structure and functions of ATP, passive and active solute transport, physiological effects and mechanism of action of growth regulators: concept & role of photoperiodism and vernalization.

Electron and proton transport, C<sub>3</sub>, C<sub>4</sub> and CAM pathways in photosynthesis, photorespiration, structure and function of lipids, fatty acid synthesis, Biological nitrogen fixation, sulphate transport and assimilation.

**4.2 Genetic Engineering**

Gene cloning technique, restriction endonucleases, plasmids and phages as vectors. Gene transfer methods in plants, transgenic plants for herbicide tolerance and insect resistance; Artificial chromosomes (BAC and YAC), Aims, objectives and major achievements of Human Genome Project.

**4.3 Plant Tissue Culture**

Concept and application of somatic embryogenesis and synthetic seed production, disadvantages of long term cultures. Protoplast isolation, culture, fusion, hybrid selection and regeneration, genetic consequences of protoplast fusion, hybrids versus cybrids, applications of protoplast research. Applications and limitations of micropropagation. Origin, prospects and achievements of somaclonal variation.

**UNIT-5**

**5.1 Ecology**

Nature and concept of biotic communities; life forms and biological spectrum; succession—mechanism & models; concept of ecosystems, energy flow; Biogeochemical cycles; Pollution – sources, types and control. Environmental impact assessment; sustainable development, ecological management.

**5.2 Plant Resource Utilization**

Origin of agriculture; centers of origin of crop plants; cereals and legumes as sources of food; medicinal plants of Jammu and Kashmir; Timber and forage plants; alcoholic beverages; green revolution; sustainable utilization of plant resources.

**5.3 Plant Resource Conservation**

Biodiversity – concept and concerns; concept of rare, threatened and endangered plants; priorities for conservation; *in situ* and *ex situ* conservation – methods and limitations; Role of markets, educational institutions, governments and religious beliefs in conservation; activities and role of IUCN, WWF, ICAR and NBPGR in plant conservation.

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