

ALAGAPPA UNIVERSITY, KARAIKUDI – 630 003

Syllabus for Pre-Registration Qualifying Entrance Examination for Ph.D. Program

PART – B: Core Paper

Discipline: **BOTANY**

Unit I- Plant Biodiversity I and II

Phycology – Introduction and history – Classification of algae (F. E. Fritch, 1945) – Occurrence and distribution of algae – Range of thallus structure. Reproduction – Life cycles of Cyanophycophyta – Chlorophycophyta – Charophyta – Bacillariophycophyta – Xanthophycophyta – Phaeophycophyta – Rhodophycophyta and their economic importance. Classification of Fungi (Alexopoulos and Mims, 1979) – Cell structure – Mode of nutrition Reproduction and life cycles of major classes – Economic importance of fungi. Lichens – Classification of lichens (Miller, 1984) – Reproduction – Economic importance of lichens. General features and Classification of Bryophytes – Range of vegetative structure – Reproduction and life cycle in major classes– Fossil bryophytes – economic importance. Pteridophytes – Origin and phylogeny – Evolution of Sorus; Apogamy and Apospory – Gametophyte development – Homosporous and Heterosporous ferns – Heterospory. Gymnosperm – general characteristics – Structure and reproduction in Cycadales, Ginkgoales, and Gnetales.

Unit II – Cell Biology and Molecular Techniques

Cell biology – ultrastructure of plant Cell and its organelles – Cell cycle and its regulation – Architectural changes of chromosomes – chromosomal aberration. Structural variations in chromosomes: Deletion, duplication, inversions and translocations – Concept of genetics – Mendelian genetics – Role of mutation in evolution – Linkage-crossing over and recombination – gene mapping, Sex determination in plants sex-linked inheritance and diseases. Plant genome organization –Cytoplasmic male sterility – seed storage proteins – Plant hormones – *T-DNA* transfer to plants – types of *Ti* plasmids for plant transformation –Transgenic plants – Tagging, mapping, and cloning of plant genes. Plant regeneration, synthetic seeds, micropropagation techniques.

Unit III – Plant Taxonomy and Plant Breeding

Plant taxonomy – Definition and scope – History – A detailed study of Natural and Modern system classification – APG-IV. International Code of Nomenclature (ICN) – Hierarchical Classification – taxonomic groups, categories, and ranks, utilization of categories – Phylogeny and origin of Angiosperms. Plant breeding: Methods of plant breeding – mass selection, pure line selection, clonal selection, hybridization, backcross breeding, inbreeding, heterosis, polyploidy, mutation breeding – Resistance breeding; principles, basis of resistance, vertical and horizontal resistance – Breeding of plants for improving yield and quality – National Biodiversity Policy.

Unit IV – Plant Physiology and Biochemistry

Water and Water relationship of the plants – A general account of absorption and translocation of water – Transpiration and stomatal mechanism. Photosynthesis – organization of thylakoids – Mechanism of photosynthesis – light reaction – the two transport chains. Respiration – glycolysis – energy conversion stages of glycolysis – regulation of glycolysis – outline of pentose phosphate pathway – Pyruvate metabolism – TCA cycle – electron transport system coupled with oxidative

phosphorylation – Nitrogen Metabolism: Biological nitrogen fixation. Plant growth regulator: Physiological effects of auxins and gibberellins – Seed: Dormancy and germination – Physiology of flowering and Photoperiodism – Biological clock – Structure of atoms, molecules, and chemical bonds – enzyme as catalysts – enzyme kinetics, properties and mechanisms of enzyme action – Biomolecules: A concise account of biomolecules – carbohydrates – classification, structure and properties of functional groups – Amino acid – structure, classification, – Proteins - classification, properties and structures – Lipids – Classification, properties, saturated and unsaturated fatty acids, plant waxes and steroids – Secondary metabolites – phenolic compounds, alkaloids, and flavonoids.

Unit V – Environmental Ecology, Evolution, and Phytogeography

Ecosystems – concept, components, and types – aquatic and terrestrial, functions, dynamics, energy flow in the ecosystem – trophic levels, food web, food chains. Ecological factors – climatic, edaphic, physiographic, and biotic factors. Population Ecology – growth and characteristics of a population, Natality, Mortality – Ecological niche and plant interactions. Plant Communities – Methods of studying vegetation - Quadrat, Line and belt methods – General account on Forests of Tamil Nadu – Mangroves in India – Impact of Air, Water, Soil Pollution, Radioactive Pollution, Noise Pollution, and Heavy Metal Pollution – Plant indicators of Pollution: bioindicators, biomonitoring, and bioremediation – Global Environmental Problems: Ozone depletion, global warming, climatic change (Rio de Janeiro earth summit) – Bio-diversity Hot spots, Management of natural resources, Remote Sensing in Ecological Science.

Reference Books

1. Pandey, B. P. (2018). College Botany - Vol. I: S Chand and Company Ltd. New Delhi.
2. Kushwaha, A. K., & Shukla, M. K. (2020). A Textbook of Algae: For Degree Students. Independently Published. USA.
3. Johri, R. M., Lata, S., & Tyagi, K. (2011). A textbook of Fungi. Dominant Publishers & Distributors Pvt. Ltd. India.
4. Awasthi, D. D. (2000). A Hand Book of Lichens. Bishen Singh Mahendra Pal Singh. India.
5. Anupama, K. (2011). Botany for Degree Students: Bryophyta. S Chand and Company Ltd. India.
6. Johri, R. M., & Lata, S., Sharma, S. (2012). A textbook of Pteridophyta. Dominant Publishers & Distributors Pvt. Ltd. India.
7. Johri, R. M., Lata, S., & Tyagi, K. (2012). A textbook of Gymnosperm. Dominant Publishers & Distributors Pvt. Ltd. India.
8. Kasana, S., & Pandey, A. K. (2021). Plant Systematics. Narendra Publishing House. India.
9. Kochhar, S. L., & Gujral, S. K. (2020). Plant physiology: theory and applications. Cambridge University Press, 2nd Edition.
10. Park, S. (2021). Plant Tissue Culture: Techniques and Experiments, Fourth Edition. Academic Press. USA.
11. Chawla, H. C. (2020). Introduction to Plant Biotechnology. Oxford & IBH publishing; 3rd edition. USA.
12. Sibi, G. (2021). Intellectual, Property Rights, Bioethics, Bio-safety and Entrepreneurship in Biotechnology. Dreamtech Press, Wiley India Pvt. Ltd. New Delhi.
13. Daniels, R. J. B., & Krishnaswamy, J. (2014). Environmental Studies. Wiley India. New Delhi.
14. Michael, P. N. (2018). Ecology. CBS Publishers & Distributors. New Delhi.
15. Pfadenhauer, J. S., & Klotzli, F. A. (2020). Global Vegetation: Fundamentals, Ecology, and

16. Distribution. Springer. Switzerland
