ALAGAPPA UNIVERSITY, KARAIKUDI- 630 003

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

Discipline: BOTANY

Unit I- Plant Biodiversity I and II

Introduction–Development of Phycology – Classification of algae – Occurrence and distribution of algae– Life cycle patterns in algae and alternation of generations. Reproduction – Life cycles of Chlorophyceae, Bacillariophyceae, Xanthophyceae, Myxophyceae, Phaeophyceae, Rhodophyceae and their comparative account. Classification of Fungi – Cell structure – Metabolism and regulation. Reproduction and life cycles, fungal genetics. Lichens– Classification of lichens — Reproduction – Lichens as indicators of pollution. General features and Classification of Bryophytes – Range of vegetative structure– Reproduction and life cycle – Fossil bryophytes. Origin of Pteridophytes and Classification and Morphology, Anatomy Reproductive Biology and phylogeny- Evolution of Sorus; Apogamy and Apospory- Gemetophyte development-Homosporous and Heterosporous ferns- Heterospory and General characteristics of Gymnosperm- pollen germination and the complexity of their female gametophyte; Structure and reproduction in Cycadales, Ginkgoales, and *Gnetum*.

Unit II- Cell Biology and Molecular Techniques

Plant Cell wall- Cell Membrane structure and function - active transport- regulation of intracellular transport- Structural and function of intracellular organelles-Architectural changes of chromosomes- chromosomal aberration. Cell cycle and cell division- Cytology of polyploids- Role of polyploids in evolution - Concept of genetics-Mendelian, genetics-laws - 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

History of classification - Cerolus Linnaeus, Natural System - Bentham and Hooker, Modern System - Engler and Prantle, Hutchinson and Takhtajan. International code of Botanical Nomenclature - Hierarchical Classification- taxonomic groups, categories and ranks, utilization of categories - Phylogeny of Angiosperms – Origin and evolution.- Methods of plant breeding; self-fertilized, cross fertilized and - Breeding of plants for improving yield and quality; mass selection, pure line selection, clonal selection, hyrbridization, backcross breeding, inbreeding, heterosis, polyploidy, mutation breeding- Resistance breeding; principles, methodology, basis of resistance, vertical and horizontal resistance, artificial epiphytotic condition, screening procedures for resistance- 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 path way – Pyruvate metabolism – TCA cycle – electron transport system coupled with oxidative phosphorylation– Mechanism of nitrogen fixation – Nitrogen uptake and assimilation. Plant growth regulators – 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 - Aminoacid – structure, classification, – Proteins - classification, properties primary and secondary, tertiary and quaternary, structures – Lipids - Classification, properties, saturated and unsaturated fatty acids, plant waxes and steroids – Secondary metabolites – phenolic compounds, alkaloids and flavonoids.

Unit V: Research Methodology

Biostatistics - Sample types, mean, mode, and median, SD, SE and ANOVA Molecular techniques PAGE, SDS – PAGE and Agarose gel electrophoresis - Isoelectric focusing - 2D Electrophoresis – Ultracentrifugation - SEM/TEM, Confocal Microscopy/ Phase Contrast Microscopy- HPLC, HPTLC, FPLC, GC, MS, MALDI Tof - Blotting techniques - Principles and techniques of Southern, Northern and Western blotting techniques and hybridization - Principles and applications of PCR, RFLP, RAPD, AFLP and DNA fingerprinting - Principle and applications of DNA sequencing - Tracking gene expression in plant cells. . Sustainable use of plant genetic resources – Geographical indications - Different types of intellectual property rights (IPR) - Patents, Trade mark, Trade secret and Copy right, GATT and WTO , Popular patents in plant biotechnology

Reference Books

1. O.P.Sharma (2007). Text book of Algae. Tata McGraw-Hill publishing company Ltd, Delhi
2. James Graham - Lee W. Wilcox - Linda E. Graham (2008). Algae (2nd edition)
3. R.M. Johri, Sneh Lata and Kavita Tyagi, (2011) A Textbook of Fungi ISBN: 9380642000
4. Rajni Gupta, APH, (2004). A Text Book of Fungi ISBN: 8176487368
5. C.S. Chandoliya (2009). Fungi: Biological Diversity ISBN: 8178844923 Cyber Tech Pub.
6. Vashishta, B. R. et al. (2008). Botany for Degree Students: Bryophyta. S. Chand and Co. Ltd., New Delhi.
7. Davis, P.H. and Heywood, V.M. (1965) Principles of Angiosperm Taxonomy. Oliver and Boyd Edinburgh.
8. Heywood, V.H. (1967) Plant Taxonomy. Edward Arnold,Great Britain.
9. Salisbury, F.B. and Ross, C.W. (1992) Plant Physiology. Wordsworth Publication, California.
10. Noggle, G.R. and Fritz, G.J. (1976) Introductory Plant Physiology. Prentice Hall, New Delhi.
11. Gamborg, O.C. and Philips G.C. (1995) Plant Cell Tissue and Organ culture. Narosa Publishing House, New Delhi.

12. Ignacimuthu, S.J. (2003) Plant Biotechnology. Oxford & IBH Publishing, New Delhi.
13. Jayaraman, J. (1972) Techniques in Biology. Higginbothams Pvt. Ltd., Madras.
14. Khan, I A and Khannum, A. (1994) Fundamentals of Biostatistics. Vikas Publishing, Hyderabad.
15. Gupta, S. P. (1990) Statistical Methods. S. Chand & Co. Ltd., New Delhi.
16. Krishnamurthy, K. V. (2004) An Advanced Textbook on Biodiversity: Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.