1

**Syllabus** **forM.Sc.** **Entrance** **in** **Botany** **2023** **M.Sc.** **Botany**

**Note:** **The** **syllabus** **prescribed** **for** **the** **entrance** **test** **has** **beendividedinto** **fifteen** **units.** **Each** **unit** **carries** **a** **weightage** **of** **four** **marks.** **Paper** **setters** **are** **required** **to** **set** **four** **multiple** **choice** **type** **questions** **with** **only** **one** **correct** **or** **most** **appropriate** **answerseparately** **for** **each** **unit,** **giving** **uniform** **representation** **to** **the** **whole** **syllabus** **contained** **therein.**

1.

2.

3.

4.

5.

6.

7.

8.

Viruses:Discovery, generalstructure, replication, DNA virus (T-phage); lytic and lysogenic cycle, RNA virus (TMV); Bacteria:Generalcharacteristics and cellstructure; reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); economic importance

Fungi: General characteristics, classification (Alexopolous, Mims & Blackwell), cell wall composition, nutrition and reproduction; life cycle of *Rhizopus* (Zygomycota), *Venturia* (Ascomycota), *Agaricus* (Basidiomycota). Fungi, bacteria, MLO’S and RLO’S. Major diseases, disease symptoms and management practices in apple, pear and apricot. Symptoms, causal organism, disease cycle and control of plant diseases: Late blight of Potato, Paddy blast, *Alternaria* leaf blight of apple, bacterial blight of rice. Symbiotic associations:Lichens and Mycorrhiza - generalaccount and significance

General characteristics, classification of Algae (Round 1965), criteria for algal classification; range of thallus organization; morphology, reproduction and life cycle of *Nostoc*, *Chlamydomonas,* *Oedogonium*, *Vaucheria,* *Ectocarpus,* *Batrachospermum*; economic importance of algae. Archegoniate **–** General characteristics, adaptations to land habit.

Bryophytes - General characteristics, Proskauer’s classification (upto family); morphology, anatomy and reproduction (excluding developmental details) of *Marchantia* and *Funaria*; Evolution of sporophyte; apogamy and apospory; alternation of generation; economic importance of bryophytes.

Pteridophytes - Generalcharacteristics; classification of Pteridophytes (Sporne 1965); Early land plants (*Rhynia*); morphology, anatomy and reproduction (excluding developmental details) of *Selaginella*, *Equisetum* and *Dryopteris*; heterospory and origin of seed habit; evolution of stellar systems in pteridophytes. Gymnosperms **-** General characteristics, classification – Christenhusz *et* *al*. 2011 (upto family); morphology, anatomy and reproduction (excluding developmental details) of *Cycas* and *Pinus*;economic importance of gymnosperms.

Introduction to Plant taxonomy; types of classification - artificial, natural and evolutionary; classification systems - Bentham and Hooker (upto series), Angiosperm Phylogeny Group (AGP) (upto order level). Numerical taxonomy - OTUs, character weighing and coding, cluster analysis; phenograms and cladograms (definitions and differences).

Role of herbarium and botanical garden, important herbaria and botanical gardens of the world and India; Flora, identification Keys: single-access and multi-access; taxonomic evidences from cytology, phytochemistry and molecular data; taxonomic hierarchy – ranks, categories and taxonomic groups; Botanical nomenclature - principles of ICN; binominal system of nomenclature, typification, author citation, valid publication, principle of priority. Meristematic and permanent tissues**:** Simple and Complex tissue (Types and Functions); Organization of root and shoot apical meristem- Histogen theory; Tunica and corpus theory. Plant organs:Structure of a typicaldicot and monocot root, stem and leaf. Secondary growth **:** Cambium- types, structure and function, Secondary growth in typicaldicot root and stem (Helianthus, Sunflower) ; General account of wood structure (Heart wood and Sap wood); Adaptations: General structure and function of cuticle, epidermis and stomata; General account of adaptations in xerophytes and hydrophytes.

2

9. Structuralorganization of flower:Development and structure of anther and pollen; Structure and types of ovules; Types of embryo sacs; Structure of a typical embryo sac. Pollination and fertilization**:** Types of pollination –Floral modifications favoring self and cross pollination; Double fertilization; Seed dispersal mechanism. Embryo and Endosperm**:** Endosperm development, structure and functions; Structure and development of dicot and monocot embryo (Capsella-bursa pestoris; maize). Apomixis and Embryogeny: Definition, types and practicalapplications of apomixis and polyembryony.

10. Plant Water Relations**:** Water potential and its components; Transpiration and its significance; Factors affecting transpiration; Ascent of Sap, Pressure flow model; Phloem loading and unloading. Mineral nutrition: Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport. Photosynthesis: Photosynthetic Pigments (Chl-a, Chl-b, xanthophylls, carotene); light harvest complexes, Photosystem I and II, Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

11. Respiration: Glycolysis, anaerobic respiration, TCA cycle; Pentose Phosphate Pathway, Electron Transport system and Oxidative phosphorylation. Enzymes: Structure, Classification and properties; Mechanism of enzyme action and enzyme inhibition. Nitrogen metabolism: concept of symbiotic and asymbiotic associations, Biological nitrogen fixation; Nitrate and ammonia assimilation. Plant growth regulators: Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA and ethylene. Plant response to light and temperature**:** Photoperiodism (SDPs, LDPs, Day neutral plants); Phytochrome (discovery and structure), redand far red light responses on photomorphogenesis; Vernalization.

12. Mendelian principles of inheritance; modified Mendelian ratios: 2:1- lethal Genes; 1:2:1-Co- dominance, incomplete dominance; 9:7; 9:4:3; 13:3; 12:3:1 and 15:1. Multiple allelism and pleiotropy.. Linkage: concept; complete & incomplete linkage, Bridges experiment. Crossing over:concept and significance. Numericaland Structuralchanges in chromosomes.

13. The cell theory; structure of prokaryotic and eukaryotic cells; structure and function of biomembranes; fluid mosaic concept, Cell wall-structure and functions. Structure and functions of ribosomes, centrioles, basal bodies, endoplasmic reticulum, golgi bodies, lysosomes, peroxisomes and glyoxisomes, mitochondria, chloroplast and nucleus. Euchromatin and heterochromatin; mitosis and meiosis; DNA- structure, types and replication-Watson and Crick’s model, Griffith’s and Avery’s transformation experiments. Types of RNA (mRNA, tRNA, rRNA), Transcription and translation in prokaryotes, genetic code. Gene regulation in Prokaryotes:Lac operon and Tryptophan operon.

14. Introduction to ecology; soil - origin, formation and composition, soil profile; water - states of water in the environment, precipitation types; light and temperature as ecologicalfactors; adaptation of hydrophytes and xerophytes, Plant communities - characteristics; ecotone and edge effect; succession - processes and types. Ecosystem: Structure; energy flow; trophic organization; food chains and food webs; ecological pyramids, primary productivity; biogeochemical cycling of carbon, nitrogen and Phosphorous. Phytogeography -biogeographicalzones of India, concept of endemism.

15. Concept of centers of origin, crop domestication; importance of germplasm diversity. Origin, morphology and uses of Wheat and Rice. Introduction, systematic position, morphological features and uses of *Crocus* *sativus* *and* *Curcuma* *domestica,* extraction methods of essential oils; systematic position and uses of *Brassica* and Coconut. Classification of fibres (based on origin). Morphology, extraction & uses of Cotton. Chemicalconstituents and uses of *Saussurea* *costus* and *Papaver* *somniferum.*