TEST NAME: 303 – BOTANY

ORIGIN AND EVOLUTION OF LIFE, MICROBIAL DIVERSITY:
Discovery of microorganisms, origin of life, spontaneous, biogenesis, Pasteur experiments, germ theory of disease. Classification of microorganisms: R.H. Whittaker's five kingdom concept, Carl Woese's- Domain system. Brief account of special groups of bacteria- Archaebacteria, Mycoplasma, Chlamydia, Actinomycetes, Rickettsias and Cyanobacteria.

Viruses- Discovery, general account, structure& replication of: T4 Phage (Lytic, Lysogenic) and TMV, Viroids, Prions. Plant diseases caused by viruses: Symptoms, transmission and control measures (Brief account only). Study of Tobacco Mosaic, Bhendi Vein clearing and Papaya leaf curl diseases.

Bacteria: Discovery, General characteristics, cell structure and nutrition. Reproduction: Asexual and bacterial recombination (Conjugation, Transformation, Transduction). Economic importance of Bacteria.

CLASSIFICATION AND DENSITYOF ALGAE, FUNGI, BRYOPHYTES, PETRIDOPHYTES, GYMNOSPERMS:

Algae: General account of thallus organization and reproduction in Algae. Fritsch classification of Algae (up to classes only) and economic importance. Structure, reproduction and life history of Oedogonium, Ectocarpus and Polysiphonia.

Fungi: General characteristics and outline classification (Ainsworth). Structure, reproduction and life history of Rhizopus (Zygomycota), Penicillium (Ascomycota), and Puccinia (Basidiomycota). Lichens: Structure and reproduction; ecological and economic importance.

Bryophytes: General characters, Classification. Structure, reproduction and Life history of Marchantia, and Funaria. Evolution of Sporophyte in Bryophytes.

Pteridophytes: General characters, classification. Structure, reproduction and life history of Lycopodium, and Marsilea. Heterospory and seed habit. Evolution of stele in Pteridophytes.

Gymnosperms: General characters, classification. Morphology, anatomy, reproduction and life history of Pinus and Gnetum. Economic importance with reference to wood, essential oils and drugs.

PLANT ANATOMY
Tissues and Tissue systems: Meristems: Root and Shoot apical meristems histological organization. Tissues: Meristematic and permanent tissues (simple, complex, secretory) Tissue systems: Epidermal, ground and vascular.

Secondary growth: Anomalous secondary growth in Achyranthes, Boerhaavia and Dracaena. Local timbers economic importance: Teak, Rosewood, Red sanders and Arjuna (Tellamaddi).

PLANT TAXONOMY

Introduction to Plant Taxonomy: Fundamental components of taxonomy (identification, nomenclature, classification), Taxonomic resources: Herbarium: functions and important herbaria, Botanical gardens, Flora, Keys: single access and multi-access, Botanical Nomenclature: Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, author citation, valid-publication).

Classification: Types of classifications: Artificial, Natural and Phylogenetic. Bentham & Hooker's system and Engler & Prantle's system of classification merits and demerits. Phylogeny, origin and evolution of Angiosperms.

Systematic Taxonomy: Systematic study and economic importance of: Asteraceae, Asclepiadaceae, Lamiaceae, Ephorbiaceae, Arecaceae,and Poaceae.

EMBRYOLOGY

Anther structure, microsporogenesis and development of male gametophyte. Ovule structure and types; Megasporogenesis, development of Monosporic, Bisporic and Tetrasporic (Peperomia ,Drusa, Adoxa) embryo sacs. Pollination and Fertilization (out lines) Endosperm development and types. Development of Dicot and Monocot embryos, Polyembryony.

PLANT PHYSIOLOGY AND METABOLISM

Plant Water relations: Physical properties of water, Importance of water to plant life. Diffusion, imbibition and osmosis; concept & components of Water potential. Absorption and transport of water and ascent of sap. Transpiration: Definition, types of transpiration, structure, opening and closing mechanism of stomata.

Mineral nutrition & Enzymes: Mineral Nutrition: Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms. Mineral ion uptake (active and passive transport). Nitrogen metabolism: biological nitrogen fixation in Rhizobium, outlines of protein synthesis (transcription and translation). Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzyme action.

Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photo phosphorylation, carbon assimilation pathways: C3, C4, and CAM (brief account). Photorespiration and its significance. Translocation of organic solutes: mechanism of phloem transport, source-sink relationships.

Plant Metabolism: Respiration: Glycolysis, anaerobic respiration, TCA cycle, electron transport system. Mechanism of oxidative phosphorylation. Lipid Metabolism: Types of lipids, Beta-oxidation.

Growth and Development: Growth and development: definition, phases and kinetics of growth. Physiological effects of phytohormones:Auxins, Gibberellins, Cytokinins, ABA, Ethylene and Brassinosteroids. Physiology of flowering: photoperiodism, role of phytochrome in flowering; Vernalization. Physiology of scenescence and Ageing.

CELL BIOLOGY

Cell Biology: Cell, the unit of life; Cell theory, Prokaryotic and eukaryotic cells; Eukaryotic cell components. Ultra structure and functions of cell wall and cell membranes. Chromosomes: morphology, organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

GENETICS

Genetic Material: DNA as the genetic material: Griffith's and Avery's transformation experiment, Hershey: Chase bacteriophage experiment. DNA structure (Watson & Crick model) replication of DNA (semi conservative). Types of RNA (mRNA, tRNA, rRNA), their structure and function.

Mendelian Inheritance: Mendel's laws of Inheritance (Monoand Di hybrid crosses); backcross and test cross. Chromosome theory of Inheritance. Linkage: concept, complete and incomplete linkage, coupling and repulsion; linkage maps based on two and three factor crosses. Crossing Over: concept & significance.

PLANT BREEDING

Plant Breeding: Introduction and Objectives of plant breeding. Methods of crop improvement: Procedure, advantages and limitations of Introduction, Selection, and Hybridization (outlines only).

Crop Improvement and Biotechnology: Role of mutations in crop improvement. Role of soma clonal variations in crop improvement. Molecular breeding: use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).

PLANT ECOLOGY& PHYTOGEOGRAPHY

Elements of Ecology: Ecology: definition, branches and significance of ecology. Climatic Factors: Light, Temperature, precipitation. Edaphic Factors: Origin, formation, composition and soil profile. Biotic Factor: Interactions between plants and animals.

Ecosystem Ecology: Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids. Productivity of ecosystem: Primary, Secondary and Net productivity. Biogeochemical cycles: Carbon, Nitrogen and Phosphorous.

Population &Community Ecology: Population: definition, characteristics and importance, Ecotypes. Plant communities: characters of a community: Frequency, density, cover, life forms, competition. Interaction between plants growing in a community.

Phytogeography: Principles of Phytogeography, Distribution (wides, endemic, discontinuous species) Phytogeography regions of India. and World. Endemism: types and causes

Plant Biodiversity and its importance: Definition, levels of biodiversity: genetic, species and ecosystem. Biodiversity hotspots: Criteria, Biodiversity hotspots of India. Loss of biodiversity: causes and conservation (In-situ and ex-situ methods). Seed banks: conservation of genetic resources and their importance.

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