

SYLLABUS FOR SCREENING TEST FOR RECRUITMENT TO THE POSTS OF ASSISTANT MASTER/MISTRESS IN LIFE SCIENCE

SUBJECT : BOTANY

Full Marks : 100

Time : 1 Hour 30 Minutes

Module – 1 : The Gateway of Life Sciences :

1. The science of Life - Definition of Life; Origin and Evolution of Life on the Earth (overview).
2. Basic Technology associated with the study of Botany - Concept of simple, compound and electron microscopy; cell fractionation and centrifugation; colorimetry; tracer techniques.
3. Cell Structure and Function - Differences between prokaryotic and eukaryotic cells; ultra structural components and functions of the cell wall, plasma membrane, nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi bodies, ribosomes, lysosomes and peroxisomes.

Module – 2 : Cell Biology and Genetics :

1. Morphology of chromosome; autosomes and sex chromosomes; differences between euchromatin and heterochromatin; basic methods of chromosome study; concept of gene; physical structure and chemical properties of nucleic acids (DNA and RNA).
2. Cell cycle; cell division (mitosis and meiosis) in plants.
3. Mendel's laws and experiments of heredity; linkage and crossing over; concept of mutation and mutagens; polyploidy.

Module – 3 : pH, Buffer, Water and Biomolecules :

1. Concept of pH; pH scale; Justification for pH value (7.0) of pure water; concept of buffer.
2. Diversification in structures of different carbohydrates (monosaccharides, disaccharides and polysaccharides); differences between reducing and non-reducing sugars.
3. Concept of structural, functional aspects and basic classification of proteins and lipids; types and classification of vitamins.

Module – 4 : Plant Physiology :

1. Concept of cell physiology - imbibition, diffusion, osmosis and plasmolysis; ascent of sap; translocation of solutes; types of transpiration and mechanism of stomatal transpiration; types of micro and macro elements required by plants.
2. Phases and factors of plant growth; precursor(s), structure and physiological roles of auxins, gibberellins, cytokinins, ethylene and abscissic acid.
3. Concept of photoperiodism and vernalization; physical and chemical nature of phytochrome; mechanism of seed dormancy and germination.

Module – 5 : Biochemistry :

1. Enzymes – Definition; basic architecture (holoenzyme, apoenzyme, coenzyme, cofactor); properties; nomenclature and classification (6 major classes with examples indicating name and reaction at least one for each class) according to IUBMB; concept of enzyme action.

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Module – 6 : Molecular Biology and Plant Biochnology :

1. Gene structure and function; genetic code; concept of DNA replication; concept of protein synthesis (outlines only).
2. Outlines of recombinant DNA technology (preliminary concept of vectors, plasmid, restriction enzymes, DNA and CDNA libraries, nucleic acid sequencing and PCR).
3. Definition and agricultural application of Plant Biotechnology; outlines of Plant tissue culture and its applicationsl concept of totipotency; basic concept and objectives of cloning and transgenic plants.

Module – 7 : Microbiology :

1. Concept of microbial world; structure of a typical phage virus; structure of a bacterial cell.
2. Basic types of bacterial on the basis of morphological features; concept and difference between Gram-positive and Gram-negative bacteria; reproduction of bacteria.
3. Concept of nitrogen-fixing bacteria; concept of pathogenic bacteria; concept of antibiotics.

Module – 8 : Plant morphology and Anatomy :

1. Root-Morphology and functions of tap and adventitious roots; different modified roots; Stems-Morphology and functions of stem different modified stems; Leaf-morphology and functions of leave phyllotaxy, stipule, modified leaves.
2. Flower – Different parts of a typical flower, flower as a modified shoot, principal types of inflorescences, types of lower (regular irregular, actinomorphic and zygomorphic), morphology and androecium and gynoecium; Fruit – definitions and types; basic morphology of seed.
3. Plant Anatomy - Concept and types of meristematic and permanent tissues; epidermal, ground and vascular tissue systems; types of stele; primary anatomical structures of root (monocot and dicot), stem (monocot and dicot) and leaf (dorsiventral and isobilateral).

Module – 9 : Plant Taxonomy :

1. Taxonomy - Definition, importance, relations of taxonomy with classification of plant groups.
2. Rules of Binomial nomenclature; basic types of classification (artificial, natural and phylogenetic).
3. Classification of plant kingdom; salient features of different plant groups (algae, fungi, bryophyte, pteridophyta, gymnosperms and angiosperms).

Module – 10 : Plant groups :

1. Life cycle pattern with special reference to alteration of generations in thallophyta (algae and fungi) and Bryophyta.
2. Life cycle pattern with special reference to alternation of generations in Pteridophyta and Gymnosperms.
3. Morphological description pattern of any angiospermic plant for its taxonomic identification; economically important angiosperms - bamboo, jute, lemon and tea.